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240 Nagle Avenue #15C, New York, NY 10034, USA

Tel: 1-323-984-7526, 323-410-1082; Fax: 1-323-984-7374, 323-908-0457

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## Contents

### General Psychology

- Effects of Foraging Related Stimuli on OLM (Object Location Memory) and Perceptual Search in the Hunter-Gatherer Theory** 157

*Espen A. Sjoberg, Geoff G. Cole, Luke T. Cannon*

- Considerations About Psychological Development of Children With ADHD (Attention Deficit Hyperactivity Disorder)** 168

*Camila Tarif F. Folquitto, Camila L. Rodrigues, Enio R. Andrade, Cristiana C. C. Rocca, Maria Thereza C. C. Souza*

### Developmental and Educational Psychology

- Elementary Schools on the Countryside From the Eyes of Four- and Five-Year-Old Children** 178

*Liana Gonçalves Pontes Sodré, Maria Aparecida D'Ávila Cassimiro*

- French Psychoanalyst Piera Aulagnier Concept About the Neurosis Psychopathology** 187

*Henrique Guilherme Scatolin*

- Structural Model of Strengths and Virtues on Basis of Positive Psychology** 193

*Zhan Qisheng, Liu Yuanyuan, Su Huili, Zhang Kuo, Feng Chuande*

### Applied Psychology

- Emotional Perception of Urban Environments** 201

*Graciela Tonello, Pablo Bobatto*

|                                                                                       |     |
|---------------------------------------------------------------------------------------|-----|
| <b>The Building of Gender Identity From the Resilience Concepts</b>                   | 212 |
| <i>Angélica Flores González, Sandra Carina Fulquez</i>                                |     |
| <b>Rating Score Data Analysis by Classical Test Theory and Many-Facet Rasch Model</b> | 222 |
| <i>Tsai-Wei Huang, Gwo-Jen Guo, William Loadman, Fang-Mei Law</i>                     |     |
| <b>The Videoinsight® Method: Application in Medical Orthopaedic Rehabilitation</b>    | 232 |
| <i>Rebecca Luciana Russo, Stefano Zaffagnini</i>                                      |     |

# Effects of Foraging Related Stimuli on OLM (Object Location Memory) and Perceptual Search in the Hunter-Gatherer Theory\*

Espen A. Sjoberg, Geoff G. Cole, Luke T. Cannon  
University of Essex, Essex, United Kingdom

The hunter-gatherer theory suggests that a division of labor existed in early human settlements whereby men were predominantly hunters and women were predominantly gatherers. Support for this theory has come from the observation that females tend to perform better on tasks concerning object location memory, a skill required for successful gathering. We tested the hunter-gatherer theory through two experiments: (1) an OLM (object location memory) task where males and females were required to encode and recall the locations of animals, fruit, and neutral stimuli; and (2) a perceptual search task where males and females were required to search for either a fruit or an animal in an array of items. With OLM, we found the usual female advantage for neutral stimuli, but this difference was abolished with animal and fruit stimuli. The perceptual search task found no significant gender differences. These results therefore provide only partial support for the hunter gatherer theory.

*Keywords:* evolution, foraging stimuli, hunter-gatherer, sex differences, OLM (object location memory), perceptual search

## Introduction

The hunter-gatherer theory (Silverman & Eals, 1992) proposes an evolution of cognitive sex differences based on a division of labour in early human settlements. The basic tenet of the theory is that men hunted for game and women gathered edible plants and fruit, causing selection pressures to arise for the development of skills associated with each set of tasks. For instance, men would have developed skills required for navigating terrain and stalking prey. In contrast, women were more restricted to their immediate environment, and their gathering role would have caused a development of location memory in order to recall food locations more effectively for subsequent harvesting. Silverman and Eals (1992) developed a measure of OLM (object location memory), which required the location of items in arrays to be recalled. In accordance with their theory they found a female advantage in this task.

Much subsequent research has confirmed the female advantage in OLM. For instance, Silverman, Choi, and Peters (2007) observed the effect with approximately 250,000 participants from over 40 countries. Furthermore, in a meta-analysis of the female advantage the effect size was found to be  $d = 0.27$  (Voyer, Postma, Brake, & Imperato-McGinley, 2007). However, this female advantage typically relies on specific experimental conditions. For instance, delaying the test phase by approximately a week will remove any sex differences observed (Honda & Nihei, 2009). Manipulating distance also modulates the effect such that a male

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Espen A. Sjoberg, MSc., Department of Psychology, University of Essex.

Geoff G. Cole, Ph.D., Department of Psychology, University of Essex.

Luke T. Cannon, BSc., Department of Psychology, University of Essex.

advantage is observed in far visual space and a female advantage in near visual space (Saucier, Lisoway, Green, & Elias, 2007). It has also been suggested that reducing the complexity of memory arrays may abolish the sex difference (Postma, Izendoorn, & De Haan, 1998; Postma, Winkel, Tuiten, & van Honk, 1999). Finally, the female advantage is more profound if implicit instructions are used. If participants are explicitly told to remember the location of items, the female advantage is typically reduced (Silverman & Eals, 1992; Eals & Silverman, 1994), though it is not entirely clear how reliable this pattern is or even why it occurs (Voyer et al., 2007).

The observed female advantage in OLM may rely on superior verbal memory. For instance, using items that are relatively hard to verbally encode will reduce the effect (Eals & Silverman, 1994), and complex pictorial art or abstract figures will remove it completely (Chipman & Kimura, 1998; Rahman, Bakare, & Serinsu, 2011). Furthermore, increasing the ecological validity of the OLM paradigm also tends to reduce the female advantage (Cherney & Ryalls, 1999; Iachini, Sergi, Ruggerio, & Gnisci, 2005). One noteworthy exception is the study of New, Krasnow, Truxaw, and Gaulin (2007), which involved a real-world scenario of remembering food locations at a farmer's market. When participants were prompted to point in the direction of various food stalls from a viewpoint, they found that women could more accurately point in the direction of previously encountered food locations in the market compared to men.

Postma et al. (1998) argued that OLM is based on a representation that codes for absolute positioning, relative positioning, or a combination of the two. This is supported by the observation that moving items to previously empty locations rather than exchanging them around on the array will abolish the female advantage (James & Kimura, 1997). Absolute positioning involves precision, and this will remove any female advantage and can even create a male advantage (Postma, Jager, Kessels, Koppeschaar, & van Honk, 2004; Postma et al., 1999). With relative positioning, the female advantage in OLM persists as females appear to be better at assessing the position of items in relation to other items as opposed to their precise location. When items are moved to empty locations, as in James and Kimura (1997), OLM relies on a precision component and females no longer have an advantage.

Sex differences in OLM are also reflected in navigation skills. Choi and Silverman (2003) found that OLM performance predicted a preference for using landmarks when navigating long distances, but this effect was only significant with females. This suggests that when women navigate they depend largely on landmarks and their relative position. By contrast, men tend to employ Euclidean strategies; navigation based on geometric properties, distance, and three-dimensional directions. Women compensate for this by relying on verbally easier-to-label landmarks. Men will tend to use cardinal directions such as north and south to navigate, while women use relative directions such as left and right (Dabbs, Chang, Strong, & Milun, 1998). The evolutionary cause for this is that men were hunters and navigated long ranges with fewer directional cues, while women stayed closer to camp and used landmarks to aid navigation.

### **Object Location Memory and Foraging Stimuli**

Given the amount of work undertaken that has examined OLM in the context of the hunter-gatherer theory, it is somewhat surprising that little research has examined the influence of stimuli type on OLM. If spatial and memory sex differences have evolved due to labor division, one can posit that women would have developed a sensitivity to aspects of fruit stimuli and men to animal stimuli. Hulbert and Ling (2007) reported that women prefer colors signaling ripeness, especially reddish hues. McGlasson, Lorince, Crandall, and Todd (2013) analysed over 100 million photographs on the website Flickr and found that women showed a preference for the colours red and green in their own photographs. In addition, Neave, Hamilton, Hutton, Tildesley, and

Pickering (2005) found that women are better than men at remembering the location of plants in a naturalistic environment. In the hunter-gatherer Hadza tribe, a population native to Tanzania, Berbesque, and Marlow (2009) found that the men prefer meat to berries, while the women show the opposite pattern.

However, only two previous studies have manipulated the stimuli in an OLM task such that they were evolutionary relevant. Cashdan, Marlowe, Crittenden, Porter, and Wood (2012) used a card-variant of the OLM paradigm to test the Hadza tribe. They used cards with pictures of local plant and animal life, but found no sex difference in performance depending on stimuli type. Krasnow et al. (2011) also used an OLM task to measure the effect of different stimuli types on performance. They found a female advantage in a stimuli category of “fruit on trees”, but no such difference with animal stimuli. However, the authors did not observe the basic female advantage in conditions that presented non-evolutionarily relevant stimuli because they employed a version of OLM using absolute positioning, something which typically removes an overall female advantage (Postma et al., 2004). One can argue that the basic female advantage effect on relative OLM needs to be shown before any conclusions can be made with respect to evolutionary relevant stimuli and the hunter-gatherer theory.

### **Perceptual Search and Foraging Stimuli**

In addition to the encoding and recall of object location, one can also argue that the hunter-gatherer theory predicts sex differences in the ability to find evolutionary relevant stimuli in a display. Specifically, the theory suggests that men and women would both employ a search strategy when foraging for game or fruit, respectively, but for different reasons: men for scanning terrain for potential game, while women would search plants for edible food. For this reason, hunter-gatherer theory predicts that men should be better than women at locating an animal in an array, while women should be better at locating fruit. Little research has been done regarding foraging-related stimuli on perceptual search, particularly in the context of sex differences. One study by Tipples, Young, Quinlan, Brooks, and Ellis (2002) examined reaction times to find fruit and animal stimuli, but did not investigate sex differences. They found that reaction times did not differ between animal and fruit stimuli. Another study investigated reaction time differences between animals and plants and found that people responded faster to animals than to plants (Lipp, Derakshan, Waters, & Logies, 2004). Again, sex differences were not measured. The authors hypothesized that reaction times associated with animals should be shorter because animals are potentially dangerous predators with unpredictable trajectories. However, as sex differences were not investigated we cannot be sure if the advantage with animals was due to males scoring higher than females.

Stoet (2011) investigated sex differences in a perceptual search task and found that men were able to detect targets in an array of distracters faster than women. Differences in performance between animals and fruit were not investigated. However, in one search task fruit was as added as a potential target. No sex differences were observed in search time between fruit and neutral stimuli (such as letters). These results may suggest an overall male advantage at detecting targets, but with fruit stimuli this difference is removed.

### **The Present Study**

The aim of the present study was to examine whether OLM and visual search is influenced by evolutionary relevant stimuli. As noted, the notion that humans have evolved as hunters and gatherers suggests a sexual asymmetry in cognitive abilities such that males will be particularly effective at processing animal stimuli and women will be particularly effective at processing fruit stimuli. In the first experiment, we employed the basic OLM paradigm in which male and female participants were required to encode and recall the locations of several object images. Importantly, there were three different classes of stimuli: animals, fruit,



and neutral (or non-foraging stimuli). The neutral condition refers to any object that is not related to hunting or gathering (for example pencils, clocks, or coffee mugs). The vast majority of previous work on OLM has used a variety of objects unrelated to hunting or gathering. In accordance with previous research, women should outperform men on OLM tasks when the stimuli have not been manipulated to reflect hunting or gathering, i.e., the stimuli are neutral (Chipman & Kimura, 1998; Voyer et al., 2007). However, as we aimed to use explicit instructions it is possible that the female advantage will be reduced and escape significance (Voyer et al., 2007). With respect to the animal and fruit conditions, the prediction is that a male improvement should occur for the animal stimuli compared to neutral stimuli, and a female improvement for the fruit stimuli because of their respective roles as game hunters are fruit gatherers in early human settlements.

In the second experiment, we assessed whether sex differences occur in perceptual search. Males and females were required to search for an animal or a fruit in an array of neutral objects. The hunter-gatherer theory posits the prediction that a male advantage may occur when searching for animal stimuli, and a female advantage when searching for fruit stimuli. In their respective hunter-gatherer roles, both men and women would have been required to use a searching process when looking for targets: Male hunters would have searched for prey among terrain, and female gatherers would have searched for fruit and vegetables among foliage. It is therefore possible that both genders would perform equally well at this task, but that an interaction should be found where men's performance increases with animal targets and women's performance increases with fruit targets.

## Experiment 1

### Materials and Methods

The experiment was approved by the University of Essex Psychology ethics committee.

A trial in the experiment consisted of six photographs randomly positioned within a uniform white background on the screen in a hexagonal design, similar to the approach by Krasnow et al. (2011). The stimuli were not mixed, but rather presented in categories, with each trial having six photographs from only one stimuli category. An example array can be seen in Figure 1. The size of each photo was  $5 \times 3.5$  cm in height and width. These were stock photos obtained via Google Images. With neutral objects, care was taken not to select stimuli that were gender-specific, such as masculine or feminine objects. As a result, neutral objects consisted of items such as pens or clocks. With animal photos there were no threatening predators such as snakes or lions to avoid evoking any fear responses. All animal photos were of potential prey such as deer, elk, or ducks, and all photos showed the animals clearly.

### Participants and Procedure

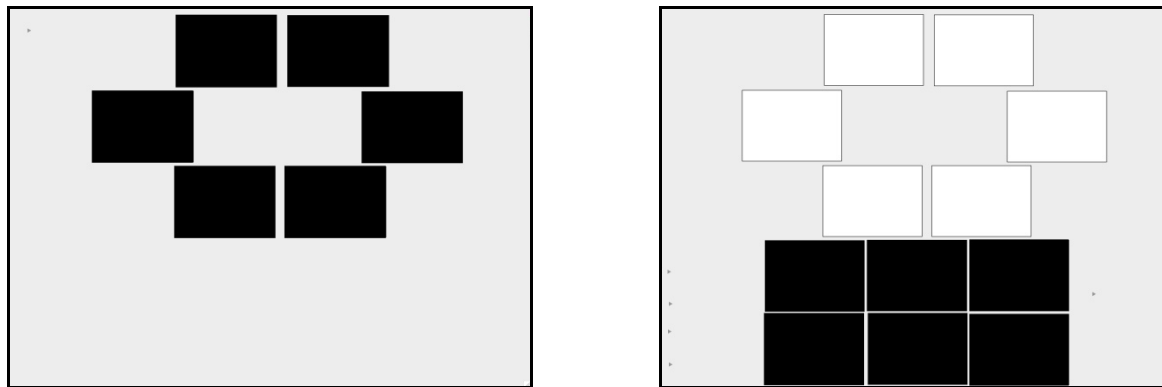
The experiment was conducted on 76 adult participants (34 males, 42 females). Participants were instructed to memorize the location of the photos and then subsequently place them into the correct positions. There were no practice trials, but participants were shown two demonstration trials by the experimenter. Before the first trial instructions were also shown on the computer screen. Participants were told that there was no time limit and that they could change their mind before continuing to the next trial. Each trial began by displaying the six-item array of photos for five seconds (i.e., the encoding phase). Participants were then required to place the photos back into their respective positions (test phase). In the encoding phase there were small black frames around the photos, and in the testing phase these frames remained as reference points. A correct response consisted of positioning a photo where it had previously been displayed. There was a three second delay between the test phase and a new trial.

The experiment employed a  $2 \times 3$  mixed design with sex as the between-subjects variable and stimuli type as the within-subjects variable. For the stimuli type variable, there were three levels: neutral, animal, and fruit.

The measurement consisted of the number of photos correctly positioned in the testing phase. There were a total of 15 trials, five trials for each of the three conditions. The presentation order of the trials was randomized.



(a) Stimulus array presentation.



(b) Location memory task.

*Figure 1.* Participants were presented with an array (a) of objects that consisted of either animals, fruit, or objects in a neutral category (that are not relevant to hunting or gathering). Participants were then required to return the objects to their initial respective places (b).

## Results

The mean number of photos correctly positioned is summarized in Figure 2. A  $2 \times 3$  mixed ANOVA, with sex as the between-participants variable and stimuli type as the within-participants variable, found no main effect of sex,  $F_{(1, 74)} = 0.153$ ,  $p = 0.697$ , and no main effect of stimuli type,  $F_{(2, 148)} = 0.732$ ,  $p = 0.483$ . A significant interaction was however found between sex and stimuli type,  $F_{(1, 148)} = 3.081$ ,  $p = 0.049$ ,  $\eta_p^2 = 0.04$ .

A follow-up independent samples  $t$ -test revealed that, as predicted, females showed greater OLM performance for neutral stimuli,  $t_{(74)} = 1.724$ ,  $p < 0.05$ ,  $d = 0.4$ . There were however no significant sex differences for either of the other two stimuli types, both  $t_{(74)} < 0.47$ ,  $ps > 0.64$ .

In sum, Experiment 1 shows the usual female OLM advantage with neutral stimuli, with an effect size in line with the previous literature (Voyer et al., 2007). However, this advantage was removed with animal and fruit stimuli.

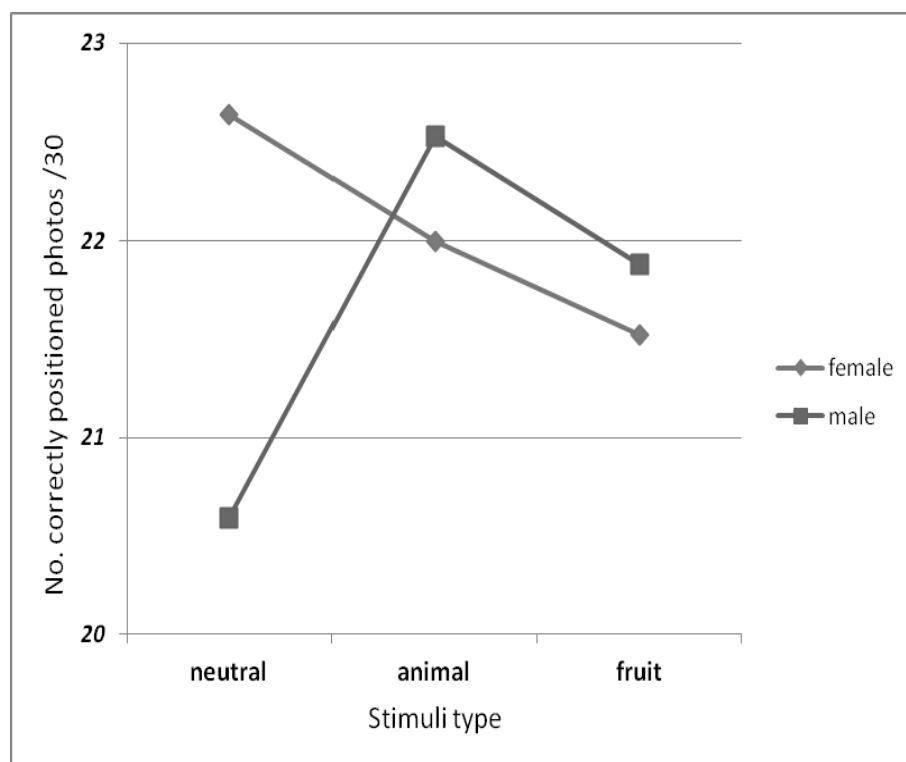


Figure 2. Means of number of correctly positioned photos in males and females across stimuli type. For males, the mean (95% confidence interval) for number of correctly positioned photos was 20.6 (18.8-22.35) for neutral, 22.5 (20.8-24.2) for animals, and 21.9 (20-23.8) for fruit. For females, it was 22.6 (21.1-24.2) for neutral, 22.0 (20.5-23.5) for animals, and 21.5 (19.8-23.2) for fruit.

## Experiment 2

### Materials and Methods

A trial consisted of 20 photographs positioned in a  $5 \times 4$  format. The size of each photo on the screen was  $4 \times 3.5$  cm (length  $\times$  height). The array was centered on the screen, and there were a total of 40 arrays. Half the arrays had 20 pictures of neutral objects (no targets), and the other half had 19 pictures of neutral objects with one photo of a target, which was a fruit or an animal. We can see Figure 3 for an example array. Targets were presented at random locations within the array. For fruit and animal stimuli, photos from Experiment 1 were used. For neutral stimuli, randomly selected objects from a variety of categories were chosen, which were taken from Google Images, though care was taken not to include any photos of humans, animals, or of plants that could potentially carry fruit.

The order of the trials was randomized. Of main interest was the measurement of reaction time to correctly detect targets. However, the number of targets correctly detected was also recorded, and if a participant “detected” a target in a neutral array (i.e., target absent) this was recorded as a false positive.

### Participants and Procedure

The experiment was conducted on 53 adult participants (24 males, 29 females).

They were instructed to watch the screen and detect either an animal or a fruit as fast and as accurate as possible clicking one of two possible buttons, labeled “Yes” or “No”. There were no practice trials, but

participants were shown a brief demonstration by the experimenter and instructions were also presented on the screen. Participants were told that all pictures of fruit and animals would show the target clearly and there should be no ambiguous photos (such as distant bushes that potentially carried berries). The experiment was presented in counter-balanced blocks with each block having either the animal or fruit as targets. There was a three second delay between response and a new trial. Upon completing a block, instructions were given again on the computer screen and the participants were allowed to take a break if they wanted.

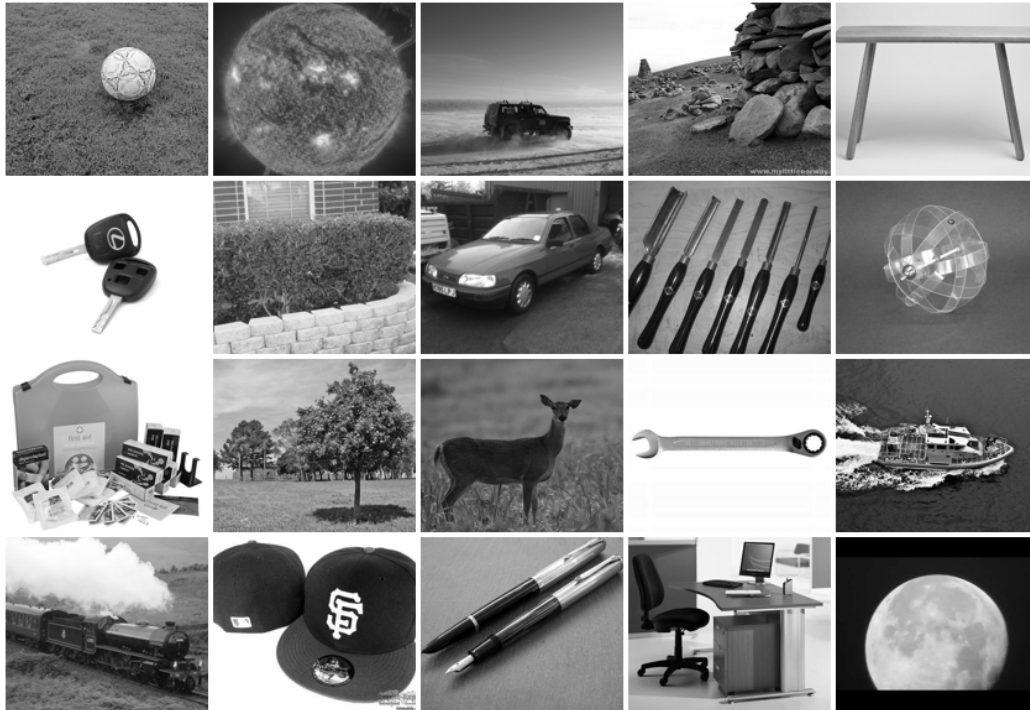


Figure 3. Example array from Experiment 2, consisting of 19 neutral objects and one animal. Participants are told to respond “Yes” as soon as they detected the animal, or “No” if they were reasonably sure no animal was present.

## Results

**Reaction time.** The mean reaction time was calculated separately for each participant. Reaction time was measured in milliseconds, and the mean reaction time for stimuli type by sex is summarized in Table 1.

Table 1

*Mean RT (Reaction Time) in Milliseconds for Fruit and Animal Targets. Mean Number of Correctly Identified Targets. Mean Number of FP (False Positives) Found, Displayed in Percentage of Responses*

|                      | Male         | Female      | Cohen's <i>d</i> |
|----------------------|--------------|-------------|------------------|
| Fruit (RT)           | 1,153 (407)  | 1,122 (319) | 0.09             |
| Animal (RT)          | 1,240 (407)  | 1,098 (229) | 0.45             |
| Fruit (No. correct)  | 8.9 (1.3)    | 9.2 (1.0)   | -0.27            |
| Animal (No. correct) | 8.9 (1.4)    | 9.1 (0.9)   | -0.18            |
| Fruit FP             | 2.3% (0.43)* | 0% (0)*     | 0.80*            |
| Animal FP            | 0.9% (0.29)  | 2.1% (0.42) | -0.33            |

Note. \*  $p = 0.01$ .

A  $2 \times 2$  mixed analysis of variance with sex as the between-subject variable and stimuli type as the within-subjects variable was conducted. No main effect of sex was found,  $F_{(1, 51)} = 1.017$ ,  $p = 0.318$ ,  $\eta_p^2 = 0.020$ , and no main effect of stimuli type,  $F_{(1, 51)} = 0.641$ ,  $p = 0.427$ ,  $\eta_p^2 = 0.012$ . There was also no significant

interaction,  $F_{(1,51)} = 1.936$ ,  $p = 0.17$ ,  $\eta_p^2 = 0.037$ , thus men and women correctly detected targets equally fast regardless of stimuli type.

**Target detection accuracy.** A  $2 \times 2$  mixed analysis of variance with sex as the between-subject variable and stimuli type as the within-subjects variable was conducted. No main effects were found for sex,  $F_{(1,51)} = 0.878$ ,  $p = 0.353$ ,  $\eta_p^2 = 0.017$ , nor stimuli type,  $F_{(1,51)} = 0.74$ ,  $p = 0.787$ ,  $\eta_p^2 = 0.001$ . There was also no significant interaction,  $F_{(1,51)} = 0.74$ ,  $p = 0.787$ ,  $\eta_p^2 = 0.001$ . Men and women correctly detected an equal amount of targets.

**False positives.** With respect to false positives, data from three participants were discarded as their responses were more than three standard deviations above the mean. A  $2 \times 2$  mixed analysis of variance with sex as the between-subject variable and stimuli type as the within-subjects variable was conducted. No main effect was found for sex,  $F_{(1,48)} = 0.473$ ,  $p = 0.495$ ,  $\eta_p^2 = 0.10$ , and no main effect of stimuli type was found either,  $F_{(1,48)} = 0.492$ ,  $p = 0.487$ ,  $\eta_p^2 = 0.10$ . However, an interaction between sex and stimuli type was found,  $F_{(1,48)} = 9.953$ ,  $p = 0.003$ ,  $\eta_p^2 = 0.172$ . Despite significance, false positives were relatively rare in the sample with 78% of participants making no such errors, and participants who did make false positives only made one (excluding the three discarded participants).

An exploratory follow-up independent samples  $t$ -test revealed that women showed significantly less false positives with fruit than men,  $t_{(48)} = 2.812$ ,  $p = 0.007$ ,  $d = 0.801$ . However, only five males made a false positive error, compared to no females, so despite significance the impact on reaction time was minimal.

In sum, men and women did not differ in their search speed for animals and fruit, nor did they differ in amount of targets correctly detected. Men made more false positives with fruit than women did, though such errors were rare.

## General Discussion

Our experiments show that in both OLM and perceptual search there was no difference in memory performance or reaction time between men and women with either fruit or animal stimuli. This does not support the hunter-gatherer theory, which should predict a male advantage with animal stimuli and a female advantage with fruit stimuli. However, the hunter-gatherer theory is only partially supported by the finding that males perform better in OLM when presented with animal stimuli compared to neutral stimuli, but this increased performance remained with fruit stimuli.

In the OLM experiment the female advantage in the neutral condition concurs with previous research in which non-evolutionary relevant stimuli are typically used. In a meta-analysis by Voyer et al. (2007) an effect size of  $d = 0.27$  was found in favor females on OLM. In our experiment we found a female advantage with the effect size  $d = 0.40$ , in line with the literature. However, it should be noted that our experiment uses explicit instructions, and the female advantage is usually reduced using this encoding context (Voyer et al., 2007). Our choice of encoding context may explain the absence of a significant main effect of sex in the OLM task, but it does not explain why women outperformed men with neutral objects that were unrelated to hunting or gathering, but not with foraging-related objects. That women and men performed equally well with animals and fruit is consistent, however, with the findings of Cashdan et al. (2012), who also found no sex difference in performance between the stimuli using explicit instructions.

In Experiment 2, we found that men and women did not differ significantly in their search speed for fruit and animals. This finding is similar to that found by Tipples, Young, Quinlan, Brooks, and Ellis (2002) who reported no difference in reaction time between animal and fruit stimuli. In addition, Stoet (2011) did not find any difference in search speed between fruit and neutral stimuli. However, Stoet also observed a significant

male advantage in his search task, while in our study the pattern suggested an overall female advantage, though this was not significant. It may be that fruit and animal stimuli carry equal evolutionary value, but for potentially different reasons. From an evolutionary point of view, fruit may have a purely survivalist value as a food source, while animals are associated with potential predators and movement detection as well as a source of food. As these qualities are equally important for both genders, this may be why no sex difference is observed between them.

The increase in male OLM performance in the animal stimuli condition, resulting in no difference with females, could be due to the animate monitoring hypothesis put forward by New, Cosmides, and Tooby (2007; see also the “behavioral urgency hypothesis”, Cole & Kuhn, 2009, 2010; Franconeri & Simons, 2003). This suggests that naturally animate organisms such as animals and humans are subject to increased processing due to a survival advantage. Predator animals, for example, may display sudden and dangerous trajectory changes, and so it is beneficial to react faster to these stimuli. Indeed, humans show faster reaction times to animals than to inanimate objects such as plants (Lipp, Derakshan, Waters, & Logies, 2004), and even mobile manmade objects such as cars (New et al., 2007). Of course, fruit stimuli are immobile and this hypothesis would suggest that animal stimuli should create a higher performance compared to fruit. However, this is not found in either the OLM task or the perceptual search task. Therefore, the underlying mechanism for animals could have caused an increase in performance with animal stimuli, but a different mechanism caused the same effect with fruit. This brings forth the notion that the evolutionary causes for the reaction mechanisms associated with fruit and animal stimuli are not mutually exclusive.

The reason why fruit would also enhance performance in males requires further examination, but it is possible that fruit carries evolutionary importance because it is a food source. If the increased performance seen with fruit was a result of labor divisions then men would not be expected to perform higher when dealing with fruit stimulus. Instead, it is likely that any underlying mechanism for fruit stimuli stems from a much deeper evolutionary origin than suggested by hunter-gatherer theory. As fruit has been an important food source for many animals across the evolutionary history, it is likely to carry equal importance in both men and women. That men and women were equally fast at detecting both fruit and animals support this notion. Even if women were gatherers in more recent human history, prior to this no labor division existed and a fruit mechanism could be the result of opportunistic searching for fruit between both sexes, much further back in human evolutionary history.

This relates to criticisms suggesting that the typical female advantage observed in OLM may not be due to a labor division in early human settlements. For instance, rats also display a female advantage in OLM, yet rats do not have a division of labor (Saucier, Shultz, Keller, Cook, & Binsted, 2008). This suggests that the observed sex differences in OLM and mental rotation in previous studies are likely to stem from a much longer evolutionary history. Stoet (2011) also argues against the hunter-gatherer theory, proposing that the division of labor in early human settlements may not have been due to skill, but convenience. Men were not necessarily hunters because they were better at it, but, for example, because child rearing prohibited women from hunting. Kuhn and Stiner (2006) emphasize that roles in a hunter-gatherer society were learned. There were also female hunters, especially in families with widows or without sons.

Jones, Braithwaite, and Healy (2003) reviewed several evolutionary theories that attempted to explain sex differences in spatial abilities. They argued that the often inconsistent evidence for hunter-gatherer theory does not fit the assumption of a gender-specific labor division and as such they propose that the Silverman and Eal’s (1992) theory is no longer viable. Jones et al. (2003) concluded that the most fitting theory to explain sex differences in spatial abilities was the range size theory, which involved males dispersing over large territories

in order to optimize mating and father more offspring. This is similar to the Ecuyer-Dab and Roberts' (2004) theory, which suggested that male competition, mating, and extensive ranging would explain male advantages in spatial abilities. In contrast, females would focus on safeguarding their survival with restricted navigation and concentration of nearby spatial cues, which could account for a why women perform better in OLM and in near space.

In sum, the present work has provided only partial support for the hunter-gatherer theory of sex differences in OLM. The usual female advantage observed in OLM tasks was abolished when participants were required to remember the locations of animal and fruit stimuli. A perceptual search task found no difference between men and women when searching for animals or fruit in an array.

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# Considerations About Psychological Development of Children With ADHD (Attention Deficit Hyperactivity Disorder)

Camila Tarif F. Folquitto, Camila L. Rodrigues, Enio R. Andrade,  
Cristiana C. C. Rocca, Maria Thereza C. C. Souza  
University of Sao Paulo, Sao Paulo, Brazil

Piaget's theory of psychological development can contribute to a better understanding of ADHD (attention deficit hyperactivity disorder). The assumption is that children with ADHD present deficits in the development of the construction of operational notions, such as space-time conceptions and causality. Sixty-nine children (aged 6 to 12) were divided into two groups: children with ADHD and children without diagnosis. According to Piaget's clinical interview, Piagetian tasks were applied. The clinical sample was sub-divided into children who used methylphenidate and non-medicated children. ADHD children showed a tendency to response and reasoning considered most common at developmental levels inferior to the comparison group. Regarding the use of methylphenidate, there was no significant difference of performance between the subgroups. Results may be indicative that the deficits relate mainly to structuring aspects of thinking, and not to performance. Theoretical and practical implications were discussed.

*Keywords:* ADHD (attention deficit hyperactivity disorder), development, cognitive processes, Piagetian tasks

## Introduction

ADHD (attention deficit hyperactivity disorder) is one of the most common disorders in infancy, and one of the main reasons to seek care in mental care child clinics in Brazil (Rohde, Miguel Filho, Benetti, Gallois, & Kieling, 2004). Over the last decades, executive functions have become important tools for understanding ADHD, and can be defined as the set of skills required to perform voluntary, independent, autonomous, self-organized, and goal-oriented actions. Executive functions account for the acquisition of features such as self-control, planning, and self-regulation, and depend on the individual's experience and socialization. Difficulties in behavioral inhibition and inhibitory control could delay the development of executive skills, and ADHD could be considered a "disorder in the development of the ability to regulate behavior with eyes in the future" (Barkley, 2002). Children with ADHD present the same sequence of phases in cognitive development, albeit slower than children without this diagnosis (Barkley, 1997). For the treatment of ADHD, psychostimulants drugs are usually indicated, such as methylphenidate. Approximately 70% of the patients under treatment with methylphenidate present improvement at least 50% of symptoms (Rohde & Halpern,

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Camila Tarif F. Folquitto, Ph.D., Institute of Psychology, University of Sao Paulo.  
Camila L. Rodrigues, M.D., Institute of Psychiatry, University of Sao Paulo.  
Enio R. Andrade, M.D., Institute of Psychiatry, University of Sao Paulo.  
Cristiana C. C. Rocca, Ph.D., Institute of Psychiatry, University of Sao Paulo.  
Maria Thereza C. C. Souza, Ph.D., professor, Institute of Psychology, University of Sao Paulo.

2004).

Piaget's genetic epistemology is an important theoretical approach for the understanding of psychological development, including its cognitive, affective, and moral aspects. The capacity to think before acting, to reflect on several possibilities, and to anticipate, in thought, the outcomes of actions, promote the child's intellectual progress. Because it is logical, operational thinking is reversible, enabling the child to objectively evaluate his/her own attitudes. Thus, an explanatory hypothesis for the symptoms presented by children with ADHD, is that the development of operational skills has lagged, hindering the reflexive processes and regulation of affective interests and valuations. According to this conception, inhibitory control can be related to operational thinking: For to be able to "think before acting", it is necessary to develop the ability to retrieve past events, in light of present events, and anticipate future outcomes.

One of the aspects required for the organization of these sequences of events and movements is time. The conception of time is crucial for the construction of reality in child, as well as the perception of causality. Piaget (1946/1971) defined time is a cognitive conception, formed by physical time (related to the temporal schemes constructed by the individual to understand relations in the physical world, leading to objective temporal measures), and experienced time (considered as the psychological duration of time, the sensation of passage of time).

Deficits in executive functions can result in difficulties to apprehend stretches of time, both in estimation and in reproduction and production of time intervals. Research has shown that children and adolescents with ADHD present specific difficulties to reproduce and estimate time intervals (Rommelse, Oosterlaan, Buitelaar, Faraone, & Sergeant, 2007; Mullins, Bellgrove, Gill, & Robertson, 2005; Além-Mar e Silva & Adda, 2007; Bauermeister et al., 2005; Barkley, 2001). If these assumptions are correct, deficits in the development of the notions of concrete operational thinking, and more specifically, of the conception of time at the concrete operational level, should be observed in these children. It is important to understand such deficits within the context of the child's development and in a theoretical framework which can enable us to consider these difficulties as differentiated developmental pathways.

Furthermore, ADHD diagnosis was recently revised. The DSM-5 considers ADHD as a neurodevelopmental disorder. This revision was based on nearly two decades of research showing that ADHD, although a disorder that begins in childhood, can continue through adulthood for some people (APA (American Psychiatric Association), 2013). Thus, researches in developmental psychology could contribute to the discussion about the development of ADHD children.

## **Method**

### **Participants**

The sample consisted of 69 children, aged between six and 12 years old. Of these participants, 37 were patients of the SEPIA (ADHD Clinic of the Child Psychiatry Service) of the IPq-HCFMUSP (Institute of Psychiatry of the Clinical Hospital of the Medical School of the University of São Paulo), and 32 were students from public schools of the City of São Paulo, Brazil. The inclusion criteria for the clinical sample were: ADHD diagnostic under the DSM-IV criteria and confirmed through the diagnostic interview K-SADS-PL (Schedule for Affective Disorders and Schizophrenia for School-Age Children/Present and Lifetime Version) (Kaufman et al., 1997). For the control group, absence of psychiatric diagnosis based on K-SADS-PL. Controls with IQ < 70

were excluded. The clinical sample's exclusion criteria were: presence of other psychiatric disorders, except ODD (oppositional defiant disorder), unavailability of family member able to adequately give information about the child, use of psychotropic drugs, except methylphenidate, and  $IQ < 70$ . All the parents responded the condensed version of the Conners questionnaire for parents, and the CBCL (child behavior checklist) (Achenbach, 1991). Seven children were excluded from the study, as they did not meet the criteria of sample composition. Thus, the final sample was composed of 62 children, between six and 12 years old, divided into a clinical sample of children ( $n = 32$ ), and a control group ( $n = 30$ ).

Table 1

*Demographic Characteristics and Clinical Variables of the ADHD and Control Groups*

|                      |         | ADHD<br>( $n = 32$ )<br>Mean SD | Normal Controls<br>( $n = 30$ )<br>Mean SD |                            |
|----------------------|---------|---------------------------------|--------------------------------------------|----------------------------|
| Age                  |         | $9.34 \pm 1.75$                 | $9.40 \pm 1.52$                            | $t = 0.013$<br>$p > 0.05$  |
| Gender               | Female  | 4 (12.5%)                       | 8 (26.7%)                                  | $\chi^2 = 1.991$           |
|                      | Male    | 28 (87.5%)                      | 22 (73.3%)                                 | $p > 0.05$                 |
| Education            |         | $3.15 \pm 1.56$                 | $3.10 \pm 1.34$                            | $t = -0.151$<br>$p > 0.05$ |
| IQ                   |         | $92.50 \pm 10.60$               | $91.40 \pm 7.59$                           | $t = -0.472$<br>$p > 0.05$ |
| Socioeconomic Status | B       | 15 (46.9%)                      | 7 (23.3%)                                  | $\chi^2 = 3.748$           |
|                      | C and D | 17 (53.1%)                      | 23 (76.7%)                                 | $p = 0.053$                |

The groups did not differ in terms of age, schooling, gender, and IQ. A statistically significant difference was observed as regards socioeconomic status. The clinical sample presented a tendency to classification at higher socioeconomic level when compared to the control group. The study was presented and approved by the Ethics Committees of the Institute of Psychology and of the Clinical Hospital of the USP (University of Sao Paulo). Participants were informed about the aims and procedures of the project, and the possibility of no participation or abandonment of the study at any time, via the term of free and clarified consent.

**Measures**

**Intelligence.** The participants' IQ was evaluated through two sub-tests of the WASI (Wechsler abbreviated scale of intelligence): vocabulary and matrix reasoning (Weschler, 1999).

**Piagetian tasks.** With Piaget's clinical interview as a reference, the following Piagetian tasks were applied: conservation of number (Piaget, 1941); criterion change-dichotomy (Inhelder, 1974); succession of perceptible events and simultaneity tasks, and the time of the action proper and interior duration (Piaget, 1946).

In the conservation of number task, six round blue chips and six red chips of the same dimension and size are used. The task began with the presentation of two equal rows of tokens arranged in parallel rows, followed by the transformation of one of the rows, or of both at once. The transformations performed never affected the number, but only the spatial distribution of the elements which were initially in visual correspondence across rows. After each transformation, the child had to judge whether or not the number of elements had changed, and to explain his/her answer.

In the criterion change task-dichotomy, geometrical shapes of different colors, shapes, and dimensions are used (six small red and blue circles; six big red and blue big circles; six small red and blues squares; and six big

red and blue squares). Researcher randomly placed the pieces on a table and asked the child to describe and classify them, separating them into two boxes.

In the succession of perceptible events task, there is a race between two small cars of different speeds, which start from a common point in the same direction. However, one of the cars moves along a longer course and arrives before the other car, which moves along a spatially shorter course.

In the simultaneity task, objects also move towards the same destination, leaving from the same starting point at different speeds. However, these objects arrive, albeit at different points, at the same time. The researcher asked the child if the objects started at the same time, next if the objects stopped at the same time or at the same moment. If the answer was no, the child was asked which of the objects stopped first.

Finally, in the time of the action proper and interior duration task, the researcher asked the child to draw lines as carefully as possible. After 15 seconds, the child was instructed to stop and draw a new series of lines, this time as quickly as possible. After 15 seconds, the child was again instructed to stop and was asked if one of the stages was longer than the other. In a second phase, the child drew lines as carefully as possible for 15 seconds; then the researcher asked the child to draw new lines as quickly as possible, and to stop after the child felt the same duration of the previous drawing had lapsed. The application of these tasks was recorded (in audio) for subsequent analysis. The tasks investigate whether the child masters operational conceptions, like conservation of number, formation of dichotomized conceptions, and the construction of the operational conception of time (physical and experienced time).

### **Procedures**

The data analysis was made through two main axes: comparison of performance in the Piagetian tasks of the clinical sample and of the control group; and comparison of children using medication with children non medicated for ADHD. The Piagetian tasks were analyzed by categories, taking into consideration the responses expected at each developmental phase. Each category was scored (1 to 3). Categories expressing more advanced developmental levels were awarded higher scores. In order to test the closeness of agreement of the evaluations, two specialists in Piagetian theory analyzed the interviews and scored the categories.

In the second stage of the task “Time of the action proper and interior duration”, in which children were asked to draw lines quickly, stopping when they feel the time was the same as the previous interval (drawing lines slowly for 15 seconds), the children’s estimates were grouped in bands of duration, in order to evaluate whether the measured duration was close to the expected 15 seconds or not. Thus, duration between 12 and 18 seconds (20% difference of the total time expected) was considered within what was expected, while other durations were considered estimates outside of the duration band.

### **Analysis**

The statistical analysis verified the type of distribution of the variables for noncategory data (age, schooling, IQ, sex, score in the Conners, and CBCL questionnaires), through the Kolmogorov-Smirnov test. The data with normal distribution were comparatively analyzed through *t*-tests; data with nonparameter distribution through the Mann-Whitney test. The data were grouped into categories (performance in Piagetian tests and socioeconomic status) were analyzed through the Chi-square test, comparing the two groups. The level of significance adopted was 5% ( $p = 0.05$ ).

Table 2

*Categories Used for Analyzing the Piagetian Tests*

| Task                                            | Level 1                                                                                                                                                                                                                         | Level 2                                                                                                                                                                                                                              | Level 3                                                                                                                                                                                                                               |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Conservation of number                          | No conservation responses (The child believes that the number of chips changes as a result of alterations in their spatial position).                                                                                           | Intermediary level between non conservation and conservation of quantity.                                                                                                                                                            | Operatory notion of quantity conservation (affirmation that the number of chips does not depend on their spatial position).                                                                                                           |
| Criterion change-dichotomy                      | Shape collections: The child is not able to separate the shapes into boxes in any of the three possible dichotomized criteria, performing random classification.                                                                | Two criteria dichotomy: The child is able to perceive two out of the three possible criteria (color/shape/size), but has difficulty anticipating and predicting possible classifications.                                            | Three criteria dichotomy: The three dichotomized criteria are admitted; the child is able to make different classifications, anticipating them in thought.                                                                            |
| Succession of perceptible events                | No differentiation between the spatial and temporal data. The child does not recognize the sequence nor the movement duration (e.g., "The car at the front moved longer because it went farther").                              | "Articulated intuition"—The child gets only one of the aspects right: He/she recognizes either the duration or the sequence. Responses at this level, as well as in the previous one, are mutually contradictory.                    | Operatory grouping of succession and duration—Time and space are totally dissociated; the child immediately points out the correct coordinations, taking into consideration the difference in speed.                                  |
| Simultaneity                                    | No simultaneity—The duration is identified as the course followed; the cars cannot have stopped at the same time, as one of them "went farther". The car which is ahead moved longer.                                           | Beginning of simultaneity—Some children do not admit simultaneity, but consider duration proportional to the course followed. Other children can notice simultaneity, by deny same duration.                                         | Immediate coordination of simultaneity—immediate correct responses: Children infer simultaneity of stops, equality of durations, and vice-versa.                                                                                      |
| Time of the action proper and interior duration | Children answer that drawing lines quickly takes longer, as they base their response in the result of the action (they draw more lines), and not in the internal perception of duration. Stage II is frequently not applicable. | Children consider the fast work to be longer, but evaluate time correctly in the second task. Others feel that the duration of the slow action "seems" longer than the other, but cannot measure time correctly in the second stage. | The answers given by children are based on introspection ("it seems", "sort of"...), to express that the duration of the two tasks is the same. In the second stage, they are able to correctly measure the duration of the interval. |

## Results

### Comparison Between the ADHD Group and the Control Group

In the Piagetian tasks (see Table 3), the control group showed a statistically significant tendency to provide answers and arguments classified at higher levels, when compared to the clinical sample in the following tasks: conservation of discrete quantity (Chips) ( $\chi^2 = 8.862$ ;  $p = 0.003$ ), simultaneity ( $\chi^2 = 11.132$ ;  $p = 0.004$ ), and time of the action proper and interior duration ( $\chi^2 = 25.859$ ;  $p < 0.001$ ). A statistically significant difference was also found in the duration band ( $\chi^2 = 14.609$ ;  $p < 0.001$ ) and the sum of all the tasks of the clinical interview ( $t = 4.749$ ;  $p < 0.001$ ). The Sequence of Perceived Events task showed a statistically significant difference between groups ( $\chi^2 = 5.311$ ;  $p = 0.070$ ) and the Dichotomy did not show any statistically significant difference between the groups ( $\chi^2 = 3.103$ ;  $p > 0.05$ ).

### Comparison Regarding Use of Methylphenidate in ADHD Group

The sociodemographic characteristics of the sub-groups of the clinical sample of children with ADHD (sub-group of medicated children ( $n = 18$ ) versus sub-group of children without medication ( $n = 14$ )) were compared in terms of age, schooling, gender, and socio-economic status, additionally to IQ. Results show that there are no statistically significant differences between the groups in terms of age, schooling, socio-economic classification, and IQ. As for gender, a statistically significant difference was observed ( $MW = 5.878$ ;  $p = 0.015$ ), with high frequency of boys.

In this sample, we obtained high prevalence of one of the sub-types when compared to the others (75% of

the combined sub-type, 19% inattentive, and 6% hyperactive), which made the statistical comparison between the different sub-types of ADHD and the performance in the Piagetian tasks impossible. Thus, only the levels of hyperactivity measured through the Conners questionnaires (for parents) and CBCL for the groups with and without medication were correlated. The comparison between the groups demonstrated that there were no statistically significant differences between the levels of hyperactivity measured through the Conners questionnaire, and the percentiles of the “ADHD” item of the CBCL. Comparing the group using methylphenidate with the group without medication, and the performance in the Piagetian tasks, there was no statistically significant difference between the groups, as indicated in Table 4.

Table 3

*Comparison of Piagetian Tests*

| Piagetian tests |                         | Cases ( <i>n</i> = 32) | Controls ( <i>n</i> = 30) | Comparison between groups |
|-----------------|-------------------------|------------------------|---------------------------|---------------------------|
| Number ***      | N.C./C.I.*              | 14                     | 3                         | $\chi^2 = 8.862$          |
|                 | Conservation            | 18                     | 27                        | $p = 0.003$               |
| Dichotomy       | Collections Fig.**      | 9                      | 4                         | $\chi^2 = 3.103$          |
|                 | Dichotomy 2             | 14                     | 12                        | $p > 0.05$                |
|                 | Dichotomy 3             | 9                      | 14                        |                           |
| Succession      | Level 1                 | 14                     | 8                         | $\chi^2 = 5.311$          |
|                 | Level 2                 | 16                     | 14                        | $p = 0.07$                |
|                 | Level 3                 | 2                      | 8                         |                           |
| Simultaneity    | Level 1                 | 14                     | 2                         | $\chi^2 = 11.132$         |
|                 | Level 2                 | 10                     | 16                        | $p = 0.004$               |
|                 | Level 3                 | 8                      | 12                        |                           |
| Time ****       | Level 1                 | 21                     | 1                         | $\chi^2 = 25.859$         |
|                 | Level 2                 | 6                      | 12                        | $p < 0.001$               |
|                 | Level 3                 | 5                      | 16                        |                           |
| Duration band   | Within average          | 9                      | 23                        | $\chi^2 = 14.609$         |
|                 | Out of average          | 23                     | 7                         | $p < 0.001$               |
| Sum of tests    | Average                 | 5.46                   | 8.03                      | $t = 4.749$               |
|                 | SD (Standard Deviation) | 2.40                   | 1.77                      | $p < 0.001$               |

Notes. \* Level 1/Level 2; \*\* Level 3; \*\*\* Conservation of number task; \*\*\*\* Time of the action proper and interior duration task.

Table 4

*Comparison of Piagetian Tests in the ADHD Group*

| Piagetian tests |                   | On medication ( <i>n</i> = 17) | Without medication ( <i>n</i> = 15) | Comparison between groups |
|-----------------|-------------------|--------------------------------|-------------------------------------|---------------------------|
| Number ***      | N.C./C.I.*        | 8                              | 6                                   | $\chi^2 = 0.161$          |
|                 | Conservation      | 9                              | 9                                   | $p > 0.05$                |
| Dichotomy       | Fig. collection** | 3                              | 6                                   | $\chi^2 = 2.137$          |
|                 | Dichotomy 2       | 9                              | 5                                   | $p > 0.05$                |
|                 | Dichotomy 3       | 5                              | 4                                   |                           |
| Succession      | Level 1           | 5                              | 9                                   | $\chi^2 = 4.034$          |
|                 | Level 2           | 10                             | 6                                   | $p > 0.05$                |
|                 | Level 3           | 2                              | 0                                   |                           |
| Simultaneity    | Level 1           | 5                              | 9                                   | $\chi^2 = 3.130$          |
|                 | Level 2           | 7                              | 3                                   | $p > 0.05$                |
|                 | Level 3           | 5                              | 3                                   |                           |
| Time ****       | Level 1           | 10                             | 11                                  | $\chi^2 = 0.792$          |
|                 | Level 2           | 4                              | 2                                   | $p > 0.05$                |
|                 | Level 3           | 3                              | 2                                   |                           |
| Duration band   | Within average    | 13                             | 10                                  | $\chi^2 = 0.379$          |
|                 | Out of average    | 4                              | 5                                   | $p > 0.05$                |
| Sum of tests    | Average           | 6.05                           | 4.80                                | $t = -1.505$              |
|                 | SD                | 2.35                           | 2.36                                | $p > 0.05$                |

Notes. \* Level 1/ Level2; \*\* Level 3; \*\*\* Conservation of number task; \*\*\*\* Time of the action proper and interior duration task.

### Discussion

The general assumption in this study was that children with ADHD between six and 12 years of age would present delay in the development of operational notions, especially the conception of time, when compared to a group of children without any diagnosis and under the same socio-demographic conditions. Results obtained corroborate this assumption, since the statistical analysis found significant differences in the comparison between the groups for nearly the totality of the Piagetian tasks applied. The implication is that, in general terms, in operational tasks, children with ADHD, more frequently than children without this diagnosis, evidenced thinking orientation responses that are characteristic of pre-operational thinking, i.e., they experience difficulties in anticipating hypothesis at the mental level and in establishing strategies, as this kind of thinking is not sustained beyond the immediate experience, lacking reversibility and flexibility.

These results are in tandem with the results found in the literature (Campos, 2007; Brown, Borden, Schleser, Clingerman, & Orenczuk, 1985; Borden, Brown, Wynne, & Schleser, 1987) of studies in which differences were observed between hyperactive and not hyperactive children in the performance of Piagetian tasks of quantity conservation (discrete quantities) and substance (continuous quantities). Therefore, the notion of conservation, essential for the construction of operational thinking, seems to be impaired in these children. Children with ADHD showed a tendency to respond more impulsively, prioritizing configurations perceived at the moment, and were unable, therefore, to achieve conservatory thinking (in which quantities are unchanged), which is typical of the concrete operational stage of development. There was also a tendency among these children to experience difficulties in measuring stretches of time: When they were supposed to interrupt the task at a time which they felt was the same as the previous one, the children of the clinical sample experienced more difficulty performing the task; they either overestimated the duration, interrupting the drawing after many seconds, or they had a tendency to estimate very short stretches of time (e.g., they drew for five seconds and stated that the same 15 seconds of the initial task had lapsed).

In this study, children with ADHD experienced deficits in the construction of the operational conception of time, both physical and experienced time, since both depend on the acquisition of adequate constructions of operational thinking, such as conservation and reversibility. These deficits result in difficulties for the child to adapt to contexts in which the objective perception of time passage is of the essence. Therefore, the construction of the conception of time (physical and experienced) is also a key aspect for the construction of the notion of self, which enables an individual to perceive himself as such, inserted in a space-time context.

Some of the main symptoms of children with ADHD are agitation, hyperactivity, and impulsivity. Based on the results which evidence that children suffering from this disorder experience difficulties in reaching the operational level, it is possible to infer that children with ADHD may experience difficulties to “think before they act”, as their thinking cannot fully transcend the present moment, thus anticipating future outcomes or relying on past experience. Therefore, the possible deficits in the construction of the conception of time found in children with ADHD would necessarily result in impairment in the construction of the notion of causality, owing to this difficulty to go beyond the perception of the present moment. Consequently, these children may present actions described as hyperactive and impulsive.

Therefore, this study has demonstrated that, at least in some specific domains, children with ADHD experience some delay in the acquisition of operational notions of thinking, such as quantity, the conception of time, conservation, and reversibility. More in depth studies are required to investigate if the operational deficits

observed can also result in difficulties that impair global logical thinking, or if there are specific domains and conceptions that are impaired in hyperactive children, relating them to the symptoms exhibited. The non-significance observed in the change of criterion-dichotomy task when we compared children with ADHD and the control group, at least in the sample collected, evidence that diagnosed children and children of the control group performed similarly. This task seems to have been a special challenge for all the children in this study. If we consider the mean age of the sample (about 9.37 years old), according to the literature (Inhelder, 1974), one would expect a predominance of responses classified at level III, characteristic of concrete operational thinking, which was not observed in this sample. However, the children in the control group, who did experience difficulties in this task, performed better in interviews of other tasks that sought to verify conception of time, thus demonstrating that they possess a better operational notion of time, which was not observed in the children with ADHD. On the contrary, they seemed to experience more difficulty in the tasks related to this domain.

The question is what happens to children with ADHD that could account for a delay in the development of operational conceptions of time. Is there really a delay in the development of operational notions, or is their performance, below expected, merely a consequence of their high level of agitation and inability to adequately focus their attention, which when controlled with medication (via psychotropic drugs), would enable these children to resort to their already constructed, albeit “camouflaged”, and operational notions?

Several studies have demonstrated an improvement in performance of children with ADHD in intelligence tests, after the use of methylphenidate (Barkley, 2002; Campbell, Douglas, & Morgenstern, 1971; Szobot, Ketzner, Parente, Biederman, & Rohde, 2004). However, when it comes to tasks aimed at evaluating the process of development, as is the case of Piagetian tasks, is the medication producing effects, at least immediate effects, in the development of these children’s cognitive structuring?

In an attempt to answer these questions, the performance of children with ADHD using methylphenidate in the Piagetian tasks was compared with the performance of children not using any medication to control the disorder. The results showed that the non significance observed may be indicative that the deficits relate mainly to structuring aspects of thinking, and not to performance. Improvement of attention focus brought about by the medication did not have an effect, in this case, in the cognitive structuring of children with ADHD. It can therefore be concluded that medication treatment may be a necessary aspect, although not sufficient to boost the development of children with ADHD. This points to the need to consider alternative intervention which includes and goes beyond pharmacological treatment.

From a constructivist standpoint stemming from the Piagetian theory, psychological development takes place through the meaningful interaction of the subject with the surrounding environment, with the contact with objects that lead to progressively more advanced cognitive and affective regulation and balance. One hypothesis for the fact that children with ADHD present deficits in the development of operational notions is that their difficulty to concentrate and high level of agitation might result in a less meaningful interaction with objects (concrete, abstract, human beings, books, toys, etc.) from the cognitive point of view. And this, because of this incapacity to focus the attention long enough on a certain object, as well as to the difficulty of thinking before acting, of going beyond the realm of physical experience, which enables, through the interaction with objects, the establishment of logical-mathematical experiences that allow for abstraction of the effect of actions and extracting significance from their own actions. ADHD children generally are able to perform successfully in the present, they “can do”, but they have difficulty recognizing the actions required to trigger the means that



leads to a successful end. From this inadequate interaction with the environment, children with ADHD showed more difficulties in the construction of cognitive skills, such as the conception of time and logical-operational capacity.

During the developmental process, the dialectic interaction of two important aspects that determine action can be observed: procedures and structures. This is an inseparable pair and is present in all behavior, even if the individual is not aware of its existence. In the child's interaction with the objects, any strategy adopted requires procedures which necessarily relate back to cognitive structuring that are already known, or that are yet to be discovered by the child. Conversely, procedures are practical actions that lead to the acquisition of new structures. This independent nature of procedures and structures enables the continuous construction of new acquisitions, fostering development (Inhelder & Piaget, 1979). From the differentiation between procedures and structures it can be concluded that results in Piagetian tasks, in which a cognitive procedure will not be successful unless it is anchored on operational structures, so that the child will not be able to solve the problem in an operational manner unless he/she understands the causal links involved in the task, a deficit in the development of operational structures was observed in children with ADHD.

It is our view that the above findings trigger new reflections on ADHD, based on a more integrated approach, in which the aspects of psychological development of the child are taken into account both from the theoretical and practical points of view. After all, as mentioned, new strategies that go beyond the medication treatment are necessary, so that during the time in which the child is able to focus attention, he/she is able to perform tasks that are enriching from the epistemic point of view, fostering the development of new abilities which, progressively, will contribute to the construction of more complex structures. Maybe this study can contribute to future investigations on the topic, seeking to more specifically ascertain how developmental psychology can contribute to the development of intervention and support strategies for ADHD.

According to Piaget (1971), action boosts development in the interaction with objects leading to progressively more complex balances. The construction of significance for actions is, therefore, at the core of psychological behavior. The child must be allowed to act in the world, but for these actions to represent a rich developmental process, we must foster an environment that on the one hand, respects the needs and rhythm of each child, and on the other, constitutes a challenging environment susceptible to foster the interest of children in learning, in a process of development which ultimately can aid the construction of a curious, inquisitive individual, in constant growth and transformation.

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## Elementary Schools on the Countryside From the Eyes of Four- and Five-Year-Old Children

Liana Gonçalves Pontes Sodré  
Bahia State University, Bahia, Brazil

Maria Aparecida D'Ávila Cassimiro  
Secretaria Municipal de Educação (SEDUC), Bahia, Brazil

The research aimed to analyze the elements highlighted in the physical space of the elementary schools in rural areas that children attend to. The methodology used was the hearing of four- and five-year-old boys and girls, mediated through pictures taken by the own children, showing the school spaces that they like and dislike, as well as pictures of free choice. The visualization of each picture encouraged the fluency of children and the specification of the aspects that they wanted to highlight. The results showed that the spaces they like the most are related to nature elements and their recreational spaces. As for spaces that they do not like, they pointed those that pose risks to their health and physical integrity, highlighting the need of renovations. Also, it was clear that schools in rural areas do not contribute to the recognition and discussion of the sociocultural context of rural children since they do not have the resources that allow their contact with elements of the local culture.

*Keywords:* children, elementary schools, rural areas, physical space

Brazil is a country of continental dimensions, therefore, its educational spaces in the countryside have been structured based on palliative solutions which frequently compromise those physical spaces attended by children, especially by those kids who are initiating their educational journey—the childhood education.

When developing the study along with the contribution of the children from a rural area in the South part of Bahia, we found childhood education schools with physical structures that may represent many schools in the countryside of the Northeast region in the country.

However, we have the obligation to offer those children an education based on humanitarian respect and dignity. Such concept must be clearly focused when the following question is analyzed: How do the rural children see the public educational spaces they go to? We understand that the study of the physical space from the young children point of view may contribute towards the discussion of public policies and pedagogical proposals as well as for the analysis of the subjective aspects regarding those children.

In an interview with Delgado and Müller (2006), Sarmiento argues that childhood is not the non-talking age, as all infants have multiple languages with which they express themselves (verbal, gestural, bodily, and plastic); childhood is not the age of non-reason, given that, in addition to the technical-instrumental rationality, other rationalities are constructed; childhood is not the age of non-working, regarding that many children work in multiple daily tasks (the child that helps with the domestic duties, others that help the parents in the fields, and others that contribute to indigenous activities etc.); childhood does not live the age of non-childhood, as the

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Liana Gonçalves Pontes Sodré, Ph.D., Bahia State University.

Maria Aparecida D'Ávila Cassimiro, Master, Secretaria Municipal de Educação (SEDUC).

childhood is present in the multiple dimensions of living, being, and belonging of a child.

With this same perspective, Corsaro (2011) presents and discusses childhood as a socially constructed period in which children live their lives, as well as a permanent structure, in a category of society that deserves specific studies. For the author, children affect and are affected by other social categories.

One of the possible research fields of infancy is childhood education, which has left the children out when they should be taken as the protagonists of a childhood education project. For being youngsters, they are shut out of decisions that directly involve them, thus many become vulnerable to abusive power of adults. Therefore, children lose space to exercise their individuality and creativity in exchange for what is previously organized for them, also in an alienating condition, which is more accented on children with lower acquisitive possession. These need to learn to deal with the means of production in the place of who produce. The author understands that the family context, educational institutions and the society as one offers the possibility to build proposals regarding an emancipated citizenship based on human dignity and, therefore, suggests the interaction with the children enabling the acknowledge of their wishes and desires (Sodré, 2002).

The childhood education, as the first stage of basic education, needs to be discussed, questioned, and revised. It is the first contact outside the walls for many children who live in the cities and the first experience of expansion of social contacts for some children from the countryside who live far away from major city centers. Caldart (2012) proposes the rural education as a concept under construction, in the modality of childhood education. It appears as a category of analysis where there are rural workers' children, composing the countryside infancies.

In this study, we discuss the physical space aspects of the scholar institution pointed out by the children; the relation between what the children focus on (based on photos) or report (in their speech) and the elements of their sociocultural context; and the possible relations between the aspects highlighted by the children and the official documents elaborated by the MEC for children's education.

The study counted on the participation of children in the condition of active and reporting subjects. The focus on what they have to say is justified based on the recognition of the children as social actors, holders of a unique way of being in their generation stage, what makes them privileged witnesses and reporters of those matters that directly affect them. Theoreticians and researchers who study childhood point out the importance of listening to what children have to say mostly in what regards them, among them stood out: Sarmiento (2007), Sodré (2002; 2007), Campos (2008), Corsaro (2011), Muller and Carvalho (2009), and others.

For Sarmiento (2007), the children's place in the contemporaneity context is changing, once the ruptures introduced by modernity have deeply altered the social condition of childhood. Children are the main victims of poverty, illness, regional war conflicts, urban insecurity, global finance crashes, and social security systems. He adds that the participation of the child in the collective life, by its own ways will certainly favor a diverse direction of the social changes already in course while transforming difficulties into possibilities of emancipation.

### **The Study**

As a mediator resource for the interlocution process with the children, we used pictures taken by infants from three different countryside schools, and how they justified or explained each photo intermediated by the reproduction in the netbook.

We assigned each school with letters and the three were named as follows: school A, school B, and school

C, all being located in environmental protection area of the county and attending riverside and agricultural communities.

Before starting the study, we tested the procedures with children of the same age group, in a school from the same area but that it was not selected to participate on this study. In this stage, we analyzed the most appropriate procedures from the training with children and camera, and we evaluated the strategy of communication with the children through the notebook and the camera, used to record the dialogue process.

From the analysis of the pilot study, we defined the details of the procedures for the study with the children's participation. Initially, we explained the research to the child, clarifying that we needed their help to talk about the educational space they attended, in order for this to happen, we would give them a camera so that they could take six pictures. Two of those pictures should be taken of a place they like in the school, another two pictures of places they did not like and the last two of random choice of their own. We gave them the camera and told them how to use it and let them play with it a little while. We also explained that after they took the pictures we would sit down and talk about places pictured and confirm their consent to participate on the study.

Once they consented with the study, we invited one by one to participate in the project. We handed them the camera and showed them how it worked; and we let them take some photos and after a brief period of test, we verified if the child was able to handle the camera. We then asked the infant to take the two first pictures of a preferred place.

After taking the two photos, we took the child to a place that was previously prepared to upload the pictures onto the notebook and we put the camera in the tape mode in order to record the interlocution with the child. We showed them the first picture and asked them questions about it. We took note of the children's answers on the following questions: Why did you choose this place? What do you like about it? Describe something that happened that made you like it? We repeated the same procedure with the second picture and, at the end of the discussion about the second photo, we added the following question: Is there anything in that picture that reminds you of something from your home?

Analysis of the pilot study showed that the process of dialogue with the six pictures was time consuming and tiring for children. In view of that, we decided to talk about two pictures of the places they did not like on another day and the photos that they chose on the following day.

Some questions were previously elaborated to stimulate the discussion with the children. However, here we only highlight the indications of the photos of the places of the school that the children liked most as well as the free areas and their respective analysis.

The concept of interpretative reproduction created by Corsaro (2011, p. 53), points out the fact that "children transform the adult world information in order to respond to the preoccupations of their own world thus they simultaneously contribute to the reproduction of adult culture". The proposal of the interlocution process built with children reflects such concept when we understand that through taking pictures the children are able to appropriate of a world planned and built by adults and when focusing on the places of the school they like most or randomly chose, it denotes the fact that they might be attentive to their own interests and in an active way ready to reflections or critics of these places.

### **What Do the Children Have to Say**

The first aspect to be highlighted is that recreation and nature appear most frequently in the justification

for the choice of places children like the most. Besides that, on the free choice pictures the most photographed places were the places which contain elements of nature. And in their justifications, it is clear the explicit relation made by the children between the act of playing and nature.

Initially, we point out for discussion the relation between child and nature, mainly because these are children who live in rural areas. In order to assure more clarity to the discussion of such relation, we describe the interlocation process with a 4-year-old girl:

- Researcher: Where is this place? Why did you take this picture?  
 Girl: The woods (it was the first and prompt response to the question).  
 Researcher: Why do you like this place?  
 Girl: Because there are trees... because there is a mango tree.  
 Researcher: Why do you like that tree?  
 Girl: Because it bears fruits.  
 Researcher: Have you ever done anything in this place you liked?  
 Girl: Yes, taking pictures.  
 Researcher: And before that, have you ever done anything else in this place?  
 Girl: I see it (the window of the child's classroom is faced towards that area).  
 So, the researcher asks the girl if she had played in that place before.  
 Girl: Yes, We played Chase, Hide and seek, and, had.

In the portrayed area (see Figure 1), outside the school, there is a subterranean water reservoir which is surrounded by plants and it is located under the shadow of a Rose Apple tree (not a mango tree as identified by the child). The shadow of the tree on the wall can be observed in the photo taken.



*Figure 1.* Picture of a 4-year-old girl of the school A in one of the places that she most likes “The Tank Cover” (Source: Study, 2012).

We point out that this is the largest outside area used by the children during their break. The external area is small (14.38 m<sup>2</sup>) and the children only used this space and the hallways of the school to play at.

What caught our attention during the interlocation process was the fact that what the child referred to “woods”, and then she explained it was a tree; it is only portrayed by its shadows on the wall. From another point of view, since the window is placed a little bit higher in the classroom than the child herself, the only sight she has is of the tree.

The different children's answers about what they like in childhood education were ordered by categories. The categories most indicated by the children were: outside in a natural environment as well as toys and games. The study discusses the fact that the interest in open spaces and nature might be associated with the possibility

of a greater social interaction through the games played with other children. It is plausible to discuss childhood education in these spaces and the experiences it provides for the infants, taking the view that in these schools they spend most of their time indoors and distant from nature and from the spontaneous children's games.

The second picture taken by the child (see Figure 2) was about the places she likes and she portrayed the school corridor (the corridor is in the external area) that connects the other classrooms. When asked about her choice the child explained that there was a vase (with plants) placed at the end of the corridor and also that she could run on it.



*Figure 2.* A picture from a 4-year-old girl in school A in one of the places where she likes (Source: Study, 2012).

As there was no visible vase with plants in the picture, the researcher repeated the question concerning the same picture in order to discard the possibility of an answer being given randomly. Notwithstanding, the child insisted on saying that she liked that place because of the vase. In a posterior photo, taken by the same child (see Figure 3), we can see a teacher sitting on a chair blocking the vision of the vase or vases. The picture of the vases is one of the child's two free choice photos. Once more the child shows coherence and consistence in her analysis about what she likes about children's education spaces by establishing a relation between nature elements and recreation.



*Figure 3.* A picture from a 4-year-old girl in school A in one of her free choice photos (Source: Study, 2012).

The analysis of this 4-year-old girl interlocation process was exemplary in comparison with the others. Children made it clear that they focus their attention on nature elements present in the schools external or open spaces. This will lead us towards the discussion of the identity process with the countryside that the school can



contribute to. The cities and the large urban centers may attract the children's attention due to its variety of opportunities or resources and they may compete with those aspects present on the rural schools. What we highlight here is that it should also be the education aim to strengthen the bond between children and their place of origin which is stated in official documents. For instance, the National Curricular Directives for Children Education (Brasil, 2010) (*Diretrizes Curriculares Nacionais para a Educação Infantil*) establishes, among other things, that the school must relate the way of life of the children to the formation of their identity.

It is important to recognize that recreation contributes in an effective way to the appropriation of the human culture process and counting on nature's elements in this process may favor the development of those children in a way that becomes coherent with their reality. To Vigotsky (2007), human-beings show a relation with the environment they are living in which they internalize signs from their surroundings, slowly arranging them as an inner symbolic system. In this process, the structuring and the perception of the acknowledgement of the world are created. In that line of thinking, an analogy can be made between statements of diverse studies such as Del Priore (2008) and Lopes and Vasconcellos (2005), when they affirm that there is a close relation between childhood living and the place where it is lived. Each social group not only elaborates the cultural dimensions making possible the surfacing of the child subjectivity related to the place, but it also designates the existence of places in the physical space that materialize such a condition. It can be inferred that the space it is not neutral, therefore, it can either be appealing, stimulating, interesting, and joyful or limit the learning and the different languages of children.

The study of the physical aspects of the educational context that they describe points towards those questions, however, it is in the justifications that such relations are better exposed.

A 5-year-old boy in his first photo portrays a place which he named "passing place" and justified it by saying that was a magical place for him, a place where he could play, a secret place leading to a cocoa tree at the end of the corridor. The child, once again, associated the picture with two things he likes: playing and nature. In the three dimension perspective of the school A (see Figure 4), we highlighted with a blue line highlights the trajectory followed by the boy from his classroom to the cocoa tree. The arrowed red line indicates the direction he looks at.

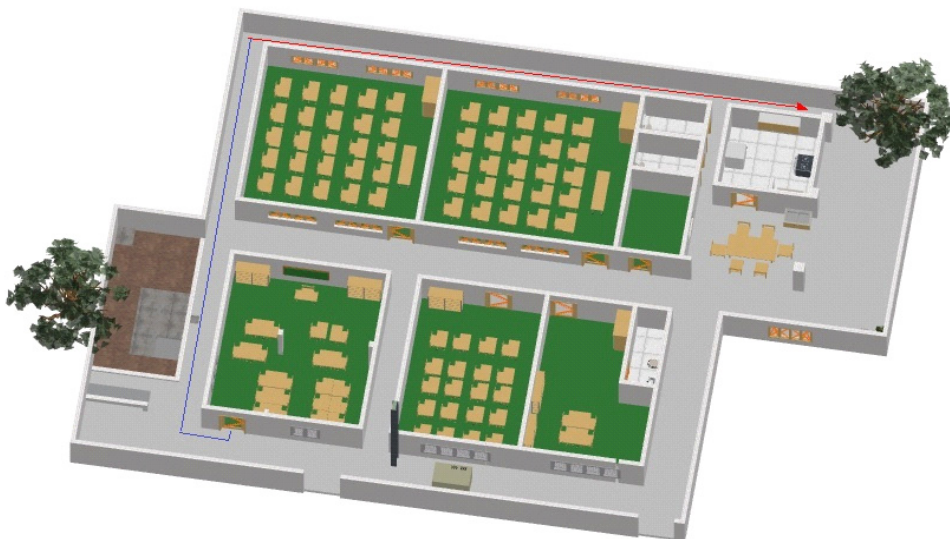


Figure 4. 3D view of school A (Source: Study, 2012).



In the free choice photos, the nature element appears again in the picture of a 4-year-old girl, whom portrays the garden (see Figure 5), thus justifying her choice: I like planting; I planted a garden at home. Also two boys portrayed nature in their pictures of free choice. The 5-year-old boy photographed (see Figure 6) an inner wall of the institution that contains a mural that is painted with flowers and gluing a rubber tree. He answered the first question saying he took a picture of flowers and of a bottom of a tree.



*Figure 5.* A picture from a 4-year-old girl in school C in one of her free choice photos (Source: Study, 2012).

The other boy also photographed the garden and it was also his first picture of free choice; in his first answer he calls it of a place to plant. In his justification of the chosen space, he says: “Because I liked it, the gardening; I planted cabbage”. It is noteworthy that, of the three educational spaces researched, this is the only one that contains a vegetable garden.



*Figure 6.* Photo from a 5-year-old girl school C (Source: Study, 2012).

Elali (2003) states that the garden can support children in understanding the mechanisms of nature, once it allows the infant to follow the plant from its plantation to its crop. Even though the space holds a garden, it is the only interaction that children may have with nature, in this institution. Therefore, the painting on the wall and the garden are the only elements in this institution that make reference to the socio-cultural universe of its children.

### Final Considerations

School A does not have an outdoor area for children to play in and the only open space is dangerous because it is next to the water reservoir that supplies the school. School C also does not have an outdoor area for children to play in and move freely and the only open space available is used to grow greens and vegetables. Although there is an outdoor area in school B it is not adequate for children to play in.

The children from the countryside who took part in the study lived their childhood in open areas in contact with nature and when they go to school they stay confined into small four walled spaces contrary to the country way of life.

Regarding the children's reflections, both boys and girls kept their preference for taking pictures of the nature and open areas. They will differ in which concerns the criteria used to choose them. Although both have mentioned in their justifications that they took the pictures because they like being in direct contact with nature, they also play in those places and they think they are beautiful. They diverged in what regards the order of preference. The word "play" appeared more times in the boy's justifications while the girls made more references to the aesthetic of the space.

The ideas presented lead us to the reflection that the physical space is not restricted to something inert, outside environmental experiences. The school perceived by the children is about the set created by the physical space and the relations that are established there.

By placing the cameras on the children's hands, the objective was to learn from their analysis and critiques. Inviting them to look at the physical space of the school, photograph it and reflect over it may have collaborated to, when taking the free pictures of their choice, they dared to overpass the classroom doors towards the open areas, justifying their choices without fear of saying that what they really wanted/needed was to play and being in contact with nature elements.

We point out that the education offered to countryside children should focus on each specific case of each inland communities way of living and recognize the different ways of life as fundamental to the construction of the identity of the diversity of the children from the countryside whether they are Quilombolas (descendants from escapee slaves), fishing communities, coastal river communities, settlers, or others.

An education that bonds the school to the community reassures the dignity conditions, respect and consideration to the diversity that enriches the Brazilian culture. Ergo, it is necessary to rethink the physical spaces that offer inadequate even inhuman arrangements contributing to the violation of the possibility of a life of dignity for the children and the professionals that work in these types of places.

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# French Psychoanalyst Piera Aulagnier Concept About the Neurosis Psychopathology

Henrique Guilherme Scatolin

PUC-SP (Pontifical Catholic University of São Paulo), São Paulo, Brazil

This article study object aims at the neurotic potentiality concept study proposed by Piera Aulagnier. From a literature review on this psychoanalyst work, the author highlights the neurotic potentiality as the conflict between the Self and his ideals, using the identificatory building metaphor. Over the results, it is pointed out that this French author does not discard the conflict between instances, nor the impulsive conflict, as described by Freud, noting that it is this conflict chronicity and intensity what specifies the neurotic commitment. It is concluded that the neurotic symptomatology will manifest when the neurotic Self invests in another Self because he wanted to be loved and protected, willing to satisfy his former childish demand, but thanks to the repression effect, this sexual pleasure becomes impossible.

*Keywords:* identificatory conflict, Self constitution, repression, children demand

From her clinical practice with psychotic patients, Aulagnier (1975) develops the potentiality concept to replace the term “structure” proposed by Jacques Lacan. When writing her book *The Interpretation Violence (A Violência da Interpretação)*, she states: “The psychotic potentiality is... a psyche organization that cannot product manifested symptoms” (p. 177). Before writing about this work, her productions were directed, among other issues, to the maniac-depressive structure, the psychotic structure, and the perverse structure. With this book publishing in 1975, this distinguished psychoanalyst replaces the term structure by potentiality. Although she does not make a concept, at that moment, of what would be the potentiality, she only states that this would be a psychic potentiality, which could remain latent or the psychosis can arise from this. Thus, Aulagnier understands that the potentiality concept is related with something virtual, in potential, due to a psychic inclination determined in childhood, in a definition quite close to the psychic inclination approached by Freud.

In 1984, when writing *The Historian Apprentice and the Wizard Master (O aprendiz de Historiador e o Mestre Feiticeiro)*, Aulagnier understands that potentiality concepts “include the ‘possible’ Self functioning and its identificatory positions, once childhood is finished” (1989, p. 228). Aulagnier understands the potentiality concept as an indentificatory position that Self will assume and the end of childhood. This means that it is at T2 point where potentiality can be established, deciding on the response and defense ways that Self can have when confronted with a conflict. Thus, it is at this moment (T2), at the moment of the conclusion time, with the assumption (or not, or partial) of castration, that the neurotic potentiality, psychotic or polymorphic definitely settles, unless the autism or a psychosis appears in childhood.

For Aulagnier, “The psychopathological phenomena totality, which we find in the clinical practice in

various forms, are the more or less disguised consequence and manifestation operating at the level of the Self investments and, therefore, in his identificatory economy” (1985, p. 18). Aulagnier understands the potentiality as identificatory conflicts, comparing the identificatory building with a puzzle. This means that when making use of a metaphor, Aulagnier points out that this puzzle fittings must be the certitude points in which the child Self will anchor. These certitude points were provided by the identified present in the parental discourse, such as the maternal, so prevalent. To these certitude points the identificants are added and by which the child is named; first, appropriating the parental discourse, to subsequently, getting certain independence.

### **The (Un)fittings and the Identificatory Conflict**

For a better understanding of such fittings, Aulagnier emphasizes that it “is effectively the identificant relation with these certitude points present in the identified that makes it possible and preserves the symbolic identification” (1985, p. 23). For prolonging the discussion on the identificatory building idea, it should be pointed out that, for Aulagnier, the zero type (T0) is related to the baby birth, with the primary identification, extending until time one (T1), at the Self institution moment through the imaginary or speculate identification. This time (T1) marks the beginning of a new identificatory journey, extending until the time two (T2), the time to conclude, when it is expected that the symbolic identification occurs, leading to the project identification. By means of infantile sexuality repression, the castration assumption leads to the Self reshaping in terms of identificatory position, causing the puzzle pieces re-fittings. This means that, at the first set of fittings which constitute the certitude points in which Shelf had anchored, other pieces are joint, which emblems consider the expected image and invested by the look of the demands recipients, adapting to the first fittings.

Regarding such fittings, Aulagnier (1985) states:

Before approaching the “identificatory conflict”..., we consider, through an artifice, the identificant-identified relation, regardless the function the identificatory aspiration occupies.... The image that is sent from Self to his own retina and the others retina is, jointly, the enunciation that he provides to these two images.... What returns to the Self as the identified that represents him, will always be different from what he expects from this present moment, in which his aspirations of yesterday materializes. And in this difference one cannot forget the role that... a mourning, a disappointment ... will have and which can affect the Self. (pp. 25-26)

This heterogeneous characteristic of Self is responsible for the conflict potentiality. This means that the weakness points of this fittings between identificant-identified, the unfitting risks and the gap between these pieces, will always be present. If this conflict occurs between the first group and the pieces added that unveil what Self is becoming, or has become, here we have a neurotic potentiality, a moment in which the conflict will occur between Self and his Ideals, causing the neurotic conflict. Thus, by understanding the potentiality as identificatory conflicts, this psychoanalyst brings new conceptions of psychopathology, where we find the psychotic potential (in which the identificatory conflict occurs inside the Self, between his identified and identificant dimensions), the neurotic potentiality, and the polymorphic potentiality (in which we have the conflict between Self and his ideals and inside Self).

### **The Neurotic Conflict**

About the neurotic conflict, Aulagnier (1985) states:

While the conflict respects the identificant-identified unit to oppose Self and his ideals, its consequences will be less

dramatic. The conflict, in this case, will be the identificatory aspirations coexistence, contradictory, that is, the contradiction between the current Self and what he wants or prohibits to become: this conflict is the neurosis. (p. 26)

Aulagnier, postulating that in the neurotic potentiality there is a conflict between Self and his Ideals, she does not exclude the conflict between instances, nor the impulsive conflict, as it is described by Freud, but points out that this conflict chronicity and intensity that specifies the neurotic commitment. So, over the course of her work, by agreeing with Freud conceptions on neurosis, her methodological and technical reflections become as a reference to the neurosis clinic, although she continues contributing to the other psychopathologies, including psychosis.

Aulagnier (1985) adds that, on neurotic potentiality, the “conflict concerns the investments between Self and the objects which it demands ‘a plus’ pleasure” (p. 138). This means that the investment in ideals is not a vital requirement, but it is necessary, at certain moments, so this Self chooses to live.

About the neurosis, she (Aulagnier, 1985) points out:

Every neurosis has its manifested form the moment in which an Oedipus complex should be dissolved, the moment in which the investment directed to the parental Selves should not disappear, but modify through a demand decantation to them directed and through the desire to find new recipients to the demands that can no longer be addressed to the parents. Repression which allows Self forget that he expected from the parents a sexual pleasure, when in fact he preserves such desire thanks to the determination that is operated.... (p. 161)

In neurosis there is an impulsive investment of Self in an expanded reality represented by a space that goes beyond the family space. The investment in a new object, in a new Self, can only come true, without a larger conflict, if Self feels confident of an agreement between this new Self and the ideal representations already invested in his past and which he cannot abandon or modify. This means that, in this extended reality, in the neurosis field, we can find an old demand that was addressed to the parents being aimed at new people, although there is Self ignorance about the sexual component neurotic included in this demand to his replacements. So, the answer the neurotic receives from this demand cannot satisfy what it is covered behind the apparent legitimacy of pleasures that this Self conjectures to ask.

In relation to this reply intended for other people, Aulagnier (1985) also falls back to repression failure, pointing out:

The neurotic symptomatology blooms when Self invested the Self of another because he thought so to satisfy his childhood demand, what proves that he only changed the recipient, without then modifying what he expected in response to his first demands: to be loved, protected, as he wanted to be loved and protected by his parents and, moreover, that give him sexual pleasure. (p. 161)

On neurosis, the demand addressed to another becomes utopian, because the other cannot be, at the same time, mother and sexual partner, as well as the father cannot become his lover, and the son (or daughter) his pleasure object. All this happens thanks to the repression effect. Thus, the neurotic symptomatology will manifest when Self invests in another Self because he wanted to be loved and protected, willing to satisfy his former childish demand, but thanks to the repression effect, this sexual pleasure becomes impossible.

For Aulagnier (1989), “By the neurosis side, T2 matches the assumption by Self of a symbolic position that he can preserve and respect” (p. 234). At this point, the neurotic conflict lies in the imaginary registry and the aggregated pieces choice. This means that the neurotic continues to project on his successive identified the shadow of that, which is supposedly the only one who can attract into his advantage a love that he could repeat

the same love expected and required in his remote childhood, but due to repression (secondary), such fact cannot be conceived.

For this psychoanalyst, the secondary repression goal is “to exclude from the Self space certain impulsive representations which representation is incompatible with cultural requirements that cannot be infringed, and with identificatory positions that are the only ones that can allow the Self to perform a portion of his desires, his demands, and his goals” (Aulagnier, 1989, p. 267). Due to this secondary repression, we found the incest and patricide interdict. This means that the interdictions pronounced by the parental instance became a megaphone of cultural requirements. These interdicts are already present in the parents repressed, i.e., in the desire to which they renounced in their remote childhoods.

Aulagnier (1990) points out that, “In the neurosis registry, the suffering essential cause the presence of a desire that we cannot or that we interdict to perform, at the same we refuse to renounce it” (p. 296). In the neurosis, as desire is related to oedipal object, its resignation is seen by the neurotic as the eventual disappearance of all desire. Consequently, the neurotic transformed into suffering causes a child investment and it still remains as a source of pleasure. Therefore, preserving the investment in other people, the neurotic creates a false illusion of his suffering disappearance.

This suffering, to Aulagnier (1990), “protects the subject of a persecutory relationship” (p. 228). It is the system itself and the neurotic commitment to adopt the suffering of a relational function in which we find his non-sharing, imposing to the neurotic, what Aulagnier calls the “absolute solitude experience” (1990, p. 298). And it is in this solitude experience that many obsessive neurotics keep their obsessive thoughts, their secret rituals, and other symptoms, under lock and key.

But after all, how does this distinguished psychoanalyst understand the neurotic symptom concept? Aulagnier (1985) defines neurotic symptom as “a compromise between the repression and the Self repressor action, after a first failure, that tries to control what returns, and creates a barrier that protected him against this irruption” (p. 17). That is, the neurotic symptomatic construction refers to the identificatory conflict existing in the space between Self and his Ideals. So, it is this conflict chronicity, presented in the neurotic symptom, which will specify the neurosis intensity.

According to Aulagnier (1990), “Whatever the neurotic symptomatology is, its center always reveals an identificatory conflict. It is proper to the neurotic Self to be taken by an unsustainable doubt concerning his truth and his affections” (p. 236). This quote matches this thesis problematic. Namely, when pointing that in all neurotics symptomatic center there is an identificatory conflict, Aulagnier points out an intrinsic relation between symptomatic formation and the identificatory problem. In addition, here it is highlighted that the importance given to the neurotic symptomatology doubt, since Self is already sentenced to doubt and not to fall into the certitude abyss.

If the ability to doubt is linked to the thinking activity, Aulagnier (1985) points out that the neurotic “can... preserve the thought functioning, preserve creativity and the resulting pleasures, and, often, super invest this pleasure” (p. 161). It is in the neurotic pathologies that the thinking and investing functions are compromised, and the right to choose the thoughts that communicate and those which he keeps secret is a vital condition for the Self proper functioning.

In the neurosis “having to think, having to doubt the thought, having to check it; these are requirements to which Self cannot avoid, the price at which he pays his citizenship right in the social field and his participation in the cultural adventure” (Aulagnier, 1990, p. 271). The self learned quickly that thinking is a necessary work

and comprises many evidences, causing pleasure and displeasure. So, think and invest denominate two functions without which the Self could not accrue, or preserve his space in the psychic scene, and the suffering, displeasure, is the price that they should pay for his existence.

For Aulagnier (1990), “The neurotic will actually have the inclination, during the session, to mainly invest ‘transference thoughts’, he will rarely think of a ‘pink cloud’ by the sole pleasure of his having this thought” (p. 277). And the neurotic subject Self should be able to oppose his pleasure or displeasure right inalienability about certain thoughts, determining his right to secretly think and experience pleasure or displeasure with it. Remember that a necessary condition to the Self functioning is present in the fact that he could exercise his right to think and enjoy on his own thought activity. On neurosis, even if the thinking freedom is not unlimited, all its forms are characterized by a partial loss of that thought freedom due to the repression action. Consequently, the exclusion of a number of thoughts becomes possible at the expense of Self thought activity impoverishment, of a loss of power to think without locks. Thus, we find here one of the neurotic suffering reasons: the intellectual inhibition.

Beyond the intellectual inhibition, on neurosis, the subject can:

Preserve the thought functioning, preserve the creativity and the pleasures that result from them and, often, super invest this pleasure...; we know it can preserve friendships and professional relations and only conflict with the beloved relationship, with the one he wanted to love or the one whose love is not according to what he himself defines by this term. (Aulagnier, 1985, pp. 161-162)

It is in this conflict that pleasure becomes random or impossible. Due to this impossibility, an aggressiveness part unties from the sexual and looks for his achievements in the external environment, whether through an aggressive behavior towards the other, or through self-aggressiveness. Thus, this aggressiveness emerges from the refusal of the other to the expected pleasure.

Regarding this aggressiveness, Aulagnier (1985) adds that “in the neurosis the impulse to death can only succeed because Self refuses the suffering cause by the absence of a pleasure to which he does not want to renounce, although the eventual realization of such pleasure implies the guilt of having transgressed the incest prohibition” (p. 162). On neurosis, the impulsive implication only becomes possible if Eros, the life impulse, finds “the objects” which can be invested. On the other hand, the aggressive response the neurotic directs to the other or to himself is, ultimately, due to the impossibility of, simultaneously, perform the incest and renounce the incestuous desire, being the guilt a result of this impossibility.

### **Conclusion**

From the literature review, this article brought the neurotic potentiality concept, noting that, although Aulagnier has a clinical experience more aimed at the psychosis field, she also left a legacy to the neurosis field, connecting it to the repressed childhood desires manifestations, being the conflict intensity between Self and his Ideals what will define the neurotic conflict. In this field, there is a former childish demand of these children desires being aimed at new people, although there is an ignorance of the sexual component neurotic Self included in this demand. Therefore, this article is completed highlighting that the neurotic symptomatology will manifest when the neurotic Self invests in another Self because he wanted to be loved and protected, willing to satisfy his former childish demand, but thanks to the repression effect, this sexual pleasure becomes impossible.



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# Structural Model of Strengths and Virtues on Basis of Positive Psychology<sup>\*</sup>

Zhan Qisheng, Liu Yuanyuan  
Tianjin University, Tianjin, China

Su Huili  
Nankai University, Tianjin, China

Zhang Kuo, Feng Chuande  
Tianjin University, Tianjin, China

Positive psychology is established by Seligman in the 1990s. It is related to a series of new concepts such as positive virtues or strengths. A variety of influential factors in positive psychology have been explored in this article. Ninety-six positive strengths and virtues have been confirmed on the basis of a survey which involves 7,059 participants. Subsequently, a structural equational model with 13 latent variables has been established according to various personality theories and results of above survey. Moreover, this model has been confirmed through confirmatory factor analysis as a nice one with good absolute fit indices and good comparative fit indices.

*Keywords:* positive psychology, strengths and virtues, fit indices, structural equational model

## Introduction

Mental health service in the world has been undergoing a huge change from focusing upon psychological problems to stressing on positive traits. Mental health practitioners, clinical psychologists, psychotherapists, and psychological counselors all put emphasis on the symptoms of human mental disorders. Positive psychology, founded in the 1990s, has put forward a new perspective of how to cope with psychological problems and concentrate upon human positive traits. Thus, a tremendous change has occurred to psychological sciences and human beings' life because of positive psychology. Above all, American psychologist Seligman and Csikszentmihalyi (2000) formally put forward the concept of positive psychology. Three main themes of positive psychology are positive subjective experience, positive personal traits, and positive environment. Seligman (1998) suggested that psychology should recover the two other missions of facilitating human good life and nurturing talent besides treating mental diseases. Building human strengths is one of the most critical goals of positive psychology.

However, first of all, we must explore the structure of human positive traits so as to reach the above goals. Many problems such as quantity, quality, and classification of strengths and virtues need to be solved. Seligman (1999) has called for a taxonomy of the strengths and virtues that promote resilience and

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Zhan Qisheng, Ph.D., associate professor, Director of Institute of Psychology, Tianjin University.

Liu Yuanyuan, Master student, Institute of Psychology, Tianjin University.

Su Huili, Doctoral student, Department of Social Psychology, Nankai University.

Zhang Kuo, Master student, Institute of Psychology, Tianjin University.

Feng Chuande, Master student, Institute of Psychology, Tianjin University.

responsibility in individuals. Meanwhile, family social scientists and family therapists have developed substantive bodies of scholarly and applied literature in such related areas as family strength frameworks (Stinnett, Stinnett, DeFrain, & DeFrain, 1997; Sandage & Hill, 2001).

As a matter of fact, positive psychology can be traced back to Maslow's humanistic theory and positive psychotherapy founded by German psychologist Peseschkian (1987). Peseschkian (1987) gave us a new analytical pathway to observe human dynamic strengths and virtues. However, positive psychology is different from humanistic psychology (Bohart & Greening, 2001). Fredrickson (2001) paid special attention to the dimension of positive emotions. Foster and Lloyd (2007) pointed out some concrete strategies of identifying and applying personal strengths and virtues. Wood and Tarrier (2010) believed that mental disorders can be treated through promoting the positive characteristics which include gratitude, flexibility, and positive emotions. In addition, people's stressors can be dealt with by means of positive imagination (Davis & Asliturk, 2011). Wong (2011) regarded meaning, virtue, resilience, and well-being as four basic elements of beautiful life. On the whole, the research on systems of positive traits of positive psychology is still scarce (Gable & Haidt, 2005). Therefore, this article will explore the structural model of positive traits.

## **Methods**

### **Sample and Participants**

Seven thousand and fifty-nine college students were surveyed. They come from 12 universities and colleges in Tianjin city, China, which involve Tianjin University, Nankai University, Tianjin Normal University, Tianjin Medical University, and so on.

### **Sex**

Among the total participants, there are 2,938 male students, accounting for 41.6%, and 3,744 female students, accounting for 53.1%. Besides, 377 (accounting for 5.3%) other college students did not answer the question of sex.

### **Measures**

To use the open-ended questions as the items of survey method. Every respondent has to answer only two questions: One is "What is my most important strength?"; and the other one is "What is my biggest weakness?".

### **Statistical Software**

All questionnaire data are analyzed by SPSS 16.0 (Statistical Product and Service Solutions) and Lisrel 8.51 (Linear Structural Relations).

## **Results and Discussion**

In this survey, 7,059 participants answered the questionnaire. Two thousand and sixty-three participants' answers are inexact, and 4,996 questionnaires are valid. The results are listed in Table 1.

On the basis of the theories of Cattell's Sixteen Personality Factors Questionnaire, Eysenck Personality Questionnaire, the Big Five Personality Traits Model, and other theories related to characteristics of cognition, emotion, and behavior in psychology, the 96 strengths and virtues can be divided into 13 latent variables, L1-L13. Each latent variable is comprised of correspondent items:

Table 1

*College Students' Strengths and Virtues*

| No. | Strengths and virtues           | Freq. |
|-----|---------------------------------|-------|
| V1  | Self-confidence                 | 982   |
| V2  | Optimistic                      | 291   |
| V3  | Conscientious                   | 235   |
| V4  | Intelligent                     | 208   |
| V5  | Diligent                        | 204   |
| V6  | Strong sociability              | 187   |
| V7  | Kindness                        | 157   |
| V8  | Understanding oneself           | 133   |
| V9  | Open-minded                     | 133   |
| V10 | Sincerity                       | 112   |
| V11 | Introspection                   | 98    |
| V12 | Perseverance                    | 94    |
| V13 | Good interpersonal relationship | 92    |
| V14 | Strong Self-control             | 83    |
| V15 | Enthusiastic                    | 79    |
| V16 | Unremitting                     | 66    |
| V17 | Easy-going                      | 62    |
| V18 | Honest                          | 62    |
| V19 | Patient                         | 59    |
| V20 | Talkative                       | 57    |
| V21 | Strong                          | 55    |
| V22 | Calmness                        | 53    |
| V23 | Motivated                       | 52    |
| V24 | Persistent                      | 50    |
| V25 | Psychological diathesis         | 46    |
| V26 | Steady                          | 45    |
| V27 | Gentle                          | 45    |
| V28 | Good-looking                    | 41    |
| V29 | Studious                        | 38    |
| V30 | Rational                        | 37    |
| V31 | Good comprehensive ability      | 36    |
| V32 | Good grades                     | 36    |
| V33 | Love sports                     | 36    |
| V34 | Good at thinking                | 35    |
| V35 | Good learning capacity          | 34    |
| V36 | With broad interests            | 34    |
| V37 | Goal-oriented                   | 34    |
| V38 | Considerate                     | 33    |
| V39 | Strong sense of responsibility  | 33    |
| V40 | Have affinity                   | 33    |
| V41 | Logical thinking                | 30    |
| V42 | Down-to-earth                   | 30    |
| V43 | Real                            | 29    |
| V44 | Helpful                         | 29    |
| V45 | Modest                          | 28    |
| V46 | Tolerant                        | 28    |
| V47 | Quick-wittedness                | 28    |
| V48 | Strong adaptability             | 28    |
| V49 | In good health                  | 25    |

(Table 1 to be continued)

| No.   | Strengths and virtues        | Freq. |
|-------|------------------------------|-------|
| V50   | Good endurance               | 25    |
| V51   | Good memory                  | 24    |
| V52   | Careful                      | 22    |
| V53   | Idealistic                   | 22    |
| V54   | Ambitious                    | 21    |
| V55   | Silent                       | 20    |
| V56   | Resilience                   | 20    |
| V57   | Good sleep                   | 18    |
| V58   | Good receptivity             | 18    |
| V59   | Practical ability            | 17    |
| V60   | Whole-hearted                | 17    |
| V61   | Thoughtful                   | 17    |
| V62   | Self-improvement             | 16    |
| V63   | Efficient                    | 15    |
| V64   | Risible                      | 15    |
| V65   | In good faith                | 14    |
| V66   | Independent                  | 13    |
| V67   | Brave                        | 13    |
| V68   | In good figure               | 12    |
| V69   | Integrity                    | 12    |
| V70   | Competent                    | 12    |
| V71   | Humorous                     | 11    |
| V72   | Good expressive power        | 11    |
| V73   | Quiet                        | 11    |
| V74   | Good self-regulation ability | 10    |
| V75   | Obedient                     | 10    |
| V76   | Organized and planed         | 9     |
| V77   | Meek                         | 9     |
| V78   | Learned                      | 9     |
| V79   | Curiosity                    | 8     |
| V80   | Strong character             | 8     |
| V81   | Lovable                      | 8     |
| V82   | Passionate                   | 7     |
| V83   | Self-supporting              | 7     |
| V84   | Imaginative                  | 7     |
| V85   | Active                       | 7     |
| V86   | Mature                       | 6     |
| V87   | Sympathetic                  | 5     |
| V88   | Innovation ability           | 5     |
| V89   | Principled                   | 5     |
| V90   | Pure                         | 5     |
| V91   | Have certain specialties     | 5     |
| V92   | High emotional quotient      | 4     |
| V93   | Leadership ability           | 4     |
| V94   | Initiative                   | 3     |
| V95   | Assertive                    | 3     |
| V96   | Generous                     | 1     |
| Total |                              | 4,996 |

L1 (goal and confidence): V1, V8, V25, V37, V53, V62, V70, V76, V78

L2 (social ability): V6, V13, V15, V20, V40, V44, V72, V92, V94

L3 (conscientiousness): V3, V5, V11, V29, V39, V52, V60, V89

L4 (optimism): V9, V55, V64, V71, V73, V79

L5 (physical characteristic): V28, V49, V57, V68, V81

L6 (intellectual ability): V31, V35, V51, V58, V59, V88, V93

L7 (willpower): V12, V14, V16, V19, V21, V24, V48, V50, V56, V74

L8 (authenticity): V10, V18, V26, V42, V43, V45, V65, V69

L9 (traits of thinking): V4, V32, V34, V41, V47, V63, V84

L10 (autonomy): V61, V66, V75, V80, V83, V95

L11 (considerateness): V7, V17, V27, V38, V46, V87, V96

L12 (aggressiveness): V2, V23, V33, V36, V54, V82, V85, V91

L13 (rationality): V22, V30, V67, V77, V86, V90

### Psychometrics

After the above-mentioned structural equational model had been established, 193 undergraduates and 126 postgraduates were invited to participate in a self-reported questionnaire with 96 strengths and virtues. Participants should rate the 96 strengths one by one from 1 to 7, in which 1 indicates “The most inappropriate to him/her”, and 7 indicates “The most appropriate to him/her”.

After inputting these data and establishing the structural equational model, by running the program with lisrel 8.51, the LISREL estimates (Maximum Likelihood) could be gotten. Afterwards, the model should be modified according to Modification Indices for LAMBDA-X matrix, Completely Standardized Solution ( $< 0.50$ ) and their meanings. For this reason, some dissatisfactory variables have to be deleted or transferred in the following.

In latent V1: delete five variables from “goal and confidence (L1)”, which are V8 (Understanding oneself), V25 (Psychological diathesis), V62 (Self-improvement), V70 (Competent), and V78(Learned).

In latent V2: delete four variables from “social ability (L2)”, which are V13 (Good interpersonal relationship), V20 (Talkative), V40 (Have affinity), V44 (Helpful), and transfer V15 (Enthusiastic) from “social ability (L2)” to “optimism (L4)”.

In latent V3: delete two variables from “conscientiousness (L3)”, which are V11 (Introspection) and V89 (Principled).

In latent V4: delete two variables from “optimism (L4)”, which are V55 (Silent) and V73 (Quiet).

In latent V5: delete three variables from “physical characteristic (L5)”, which are V49 (In good health), V57 (Good sleep), and V81(Lovable).

In latent V6: transfer only one variable from “intellectual ability (L6)” to “social ability (L2)”, which is V93 (Leadership ability).

In latent V7: delete five variables from “willpower (L7)”, which are V19 (Patient), V21 (Strong), V48 (Strong adaptability), V50 (Good endurance), and V74 (Good self-regulation ability).

In latent V8: delete five variables from “authenticity (L8)”, which are V10 (Sincerity), V26 (Steady), V42 (Down-to-earth), V43 (Real), and V69 (Integrity).

In latent V9: delete only one variable from “traits of thinking (L9)”, which is V32 (Good grades).

In latent V10: delete three variables from “autonomous (L10)”, which are V66 (Independent), V75 (Obedient), and V80 (Strong character).

In latent V11: delete two variables from “considerateness (L11)”, which are V7 (Kindness) and V87 (Sympathetic).

In latent V12: delete five variables from “aggressiveness (L12)”, which are V2 (Optimistic), V33 (Love sports), V82 (Passionate), V85 (Active), and V91 (Have certain specialties).

In latent V13: delete three variables from “rationality (L13)”, which are V67 (Brave), V77 (Meek), and V90 (Pure).

Other 96 satisfactory variables are composed of New Structural Equational Model in LAMBDA-X matrix. The LAMBDA-X matrix can be tabulated in Table 2.

Table 2

*Factor Load of Different Items in Their Corresponding Latent Variables*

| No. | Item                           | L1   | L2   | L3   | L4   | L5   | L6   | L7   | L8 | L9 | L10 | L11 | L12 | L13 |
|-----|--------------------------------|------|------|------|------|------|------|------|----|----|-----|-----|-----|-----|
| V37 | goal-oriented                  | 0.66 |      |      |      |      |      |      |    |    |     |     |     |     |
| V53 | idealistic                     | 0.63 |      |      |      |      |      |      |    |    |     |     |     |     |
| V1  | self-confidence                | 0.51 |      |      |      |      |      |      |    |    |     |     |     |     |
| V76 | organized and planned          | 0.59 |      |      |      |      |      |      |    |    |     |     |     |     |
| V72 | good expressive power          |      | 0.67 |      |      |      |      |      |    |    |     |     |     |     |
| V92 | high emotional quotient        |      | 0.55 |      |      |      |      |      |    |    |     |     |     |     |
| V15 | enthusiastic                   |      |      |      | 0.75 |      |      |      |    |    |     |     |     |     |
| V6  | strong sociability             |      | 0.54 |      |      |      |      |      |    |    |     |     |     |     |
| V94 | initiative                     |      | 0.75 |      |      |      |      |      |    |    |     |     |     |     |
| V29 | studious                       |      |      | 0.62 |      |      |      |      |    |    |     |     |     |     |
| V5  | diligent                       |      |      | 0.66 |      |      |      |      |    |    |     |     |     |     |
| V3  | conscientious                  |      |      | 0.59 |      |      |      |      |    |    |     |     |     |     |
| V52 | careful                        |      |      | 0.55 |      |      |      |      |    |    |     |     |     |     |
| V39 | strong sense of responsibility |      |      | 0.53 |      |      |      |      |    |    |     |     |     |     |
| V60 | whole-hearted                  |      |      | 0.56 |      |      |      |      |    |    |     |     |     |     |
| V64 | risible                        |      |      |      | 0.52 |      |      |      |    |    |     |     |     |     |
| V9  | open-minded                    |      |      |      | 0.69 |      |      |      |    |    |     |     |     |     |
| V71 | humorous                       |      |      |      | 0.52 |      |      |      |    |    |     |     |     |     |
| V79 | curiosity                      |      |      |      | 0.55 |      |      |      |    |    |     |     |     |     |
| V68 | in good figure                 |      |      |      |      | 0.59 |      |      |    |    |     |     |     |     |
| V28 | good-looking                   |      |      |      |      | 0.75 |      |      |    |    |     |     |     |     |
| V88 | innovation ability             |      |      |      |      |      | 0.68 |      |    |    |     |     |     |     |
| V59 | practical ability              |      |      |      |      |      | 0.52 |      |    |    |     |     |     |     |
| V51 | good memory                    |      |      |      |      |      | 0.62 |      |    |    |     |     |     |     |
| V58 | good receptivity               |      |      |      |      |      | 0.51 |      |    |    |     |     |     |     |
| V31 | good comprehensive ability     |      |      |      |      |      | 0.63 |      |    |    |     |     |     |     |
| V35 | good learning capacity         |      |      |      |      |      | 0.74 |      |    |    |     |     |     |     |
| V93 | Leadership ability             |      | 0.72 |      |      |      |      |      |    |    |     |     |     |     |
| V16 | unremitting                    |      |      |      |      |      |      | 0.80 |    |    |     |     |     |     |
| V56 | resilience                     |      |      |      |      |      |      | 0.58 |    |    |     |     |     |     |
| V12 | perseverance                   |      |      |      |      |      |      | 0.78 |    |    |     |     |     |     |

(Table 2 to be continued)

| No. | Item                 | L1 | L2 | L3 | L4 | L5 | L6 | L7   | L8   | L9   | L10  | L11  | L12  | L13  |
|-----|----------------------|----|----|----|----|----|----|------|------|------|------|------|------|------|
| V24 | persistent           |    |    |    |    |    |    | 0.60 |      |      |      |      |      |      |
| V14 | strong self-control  |    |    |    |    |    |    | 0.72 |      |      |      |      |      |      |
| V18 | honest               |    |    |    |    |    |    |      | 0.62 |      |      |      |      |      |
| V65 | in good faith        |    |    |    |    |    |    |      | 0.55 |      |      |      |      |      |
| V45 | modest               |    |    |    |    |    |    |      | 0.54 |      |      |      |      |      |
| V4  | intelligent          |    |    |    |    |    |    |      |      | 0.56 |      |      |      |      |
| V34 | good at thinking     |    |    |    |    |    |    |      |      | 0.65 |      |      |      |      |
| V47 | quick-wittedness     |    |    |    |    |    |    |      |      | 0.71 |      |      |      |      |
| V84 | imaginative          |    |    |    |    |    |    |      |      | 0.51 |      |      |      |      |
| V63 | efficient            |    |    |    |    |    |    |      |      | 0.62 |      |      |      |      |
| V41 | logical thinking     |    |    |    |    |    |    |      |      | 0.54 |      |      |      |      |
| V61 | thoughtful           |    |    |    |    |    |    |      |      |      | 0.68 |      |      |      |
| V95 | assertive            |    |    |    |    |    |    |      |      |      | 0.78 |      |      |      |
| V83 | self-supporting      |    |    |    |    |    |    |      |      |      | 0.58 |      |      |      |
| V96 | generous             |    |    |    |    |    |    |      |      |      |      | 0.50 |      |      |
| V46 | tolerant             |    |    |    |    |    |    |      |      |      |      | 0.70 |      |      |
| V27 | gentle               |    |    |    |    |    |    |      |      |      |      | 0.68 |      |      |
| V38 | considerate          |    |    |    |    |    |    |      |      |      |      | 0.53 |      |      |
| V17 | easy-going           |    |    |    |    |    |    |      |      |      |      | 0.59 |      |      |
| V23 | motivated            |    |    |    |    |    |    |      |      |      |      |      | 0.62 |      |
| V54 | ambitious            |    |    |    |    |    |    |      |      |      |      |      | 0.66 |      |
| V36 | with broad interests |    |    |    |    |    |    |      |      |      |      |      | 0.57 |      |
| V22 | calmness             |    |    |    |    |    |    |      |      |      |      |      |      | 0.76 |
| V86 | mature               |    |    |    |    |    |    |      |      |      |      |      |      | 0.58 |
| V30 | rational             |    |    |    |    |    |    |      |      |      |      |      |      | 0.63 |

In addition, the correlation coefficients between thirteen Latent Variables are presented in PHI matrix. The results can be tabulated in Table 3.

Table 3

*Correlation Coefficients Between Latent Variables*

| Latent variable            | L1   | L2   | L3   | L4   | L5   | L6   | L7   | L8   | L9   | L10  | L11  | L12  | L13  |
|----------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1. goal and confidence     | 1.00 |      |      |      |      |      |      |      |      |      |      |      |      |
| 2. social ability          | 0.80 | 1.00 |      |      |      |      |      |      |      |      |      |      |      |
| 3. conscientiousness       | 0.78 | 0.59 | 1.00 |      |      |      |      |      |      |      |      |      |      |
| 4. optimism                | 0.49 | 0.66 | 0.29 | 1.00 |      |      |      |      |      |      |      |      |      |
| 5. physical characteristic | 0.57 | 0.46 | 0.41 | 0.32 | 1.00 |      |      |      |      |      |      |      |      |
| 6. intellectual ability    | 0.73 | 0.72 | 0.56 | 0.64 | 0.54 | 1.00 |      |      |      |      |      |      |      |
| 7. willpower               | 0.79 | 0.46 | 0.87 | 0.26 | 0.40 | 0.53 | 1.00 |      |      |      |      |      |      |
| 8. authenticity            | 0.46 | 0.22 | 0.74 | 0.32 | 0.22 | 0.36 | 0.47 | 1.00 |      |      |      |      |      |
| 9. traits of thinking      | 0.77 | 0.72 | 0.57 | 0.58 | 0.57 | 0.99 | 0.59 | 0.32 | 1.00 |      |      |      |      |
| 10. autonomy               | 0.86 | 0.85 | 0.59 | 0.43 | 0.38 | 0.70 | 0.55 | 0.25 | 0.76 | 1.00 |      |      |      |
| 11. considerateness        | 0.43 | 0.43 | 0.48 | 0.65 | 0.32 | 0.49 | 0.32 | 0.71 | 0.48 | 0.76 | 1.00 |      |      |
| 12. aggressiveness         | 0.79 | 0.86 | 0.50 | 0.87 | 0.46 | 0.78 | 0.44 | 0.47 | 0.80 | 0.80 | 0.62 | 1.00 |      |
| 13. rationality            | 0.67 | 0.56 | 0.60 | 0.28 | 0.52 | 0.71 | 0.62 | 0.39 | 0.65 | 0.65 | 0.54 | 0.45 | 1.00 |

Note. All *t*-values of above correlation coefficients are larger than 2.00 ( $t \geq 2.00, p < 0.05$ ).

Finally, the absolute model fit indices and the comparative model fit indices can be showed in Table 4.

The results of Table 4 show that in this model, RMSEA (Root Mean Square Error of Approximation) is less than 0.08, and NNFI (Non-Normed Fit Index), CFI (Comparative Fit Index), and IFI (Incremental Fit Index) are all greater than 0.90, which indicate that this model has satisfactory fit indices.

Table 4

*Various Fit Indices of Strengths and Virtues Model*

| $\chi^2$ | df   | RMSEA | NNFI | CFI  | IFI  |
|----------|------|-------|------|------|------|
| 1660.42  | 1406 | 0.035 | 0.91 | 0.92 | 0.92 |

Notes. RMSEA: Root Mean Square Error of Approximation; NNFI: Non-Normed Fit Index; CFI: Comparative Fit Index; IFI: Incremental Fit Index.

According to the results of Tables 2, 3, and 4, this article confirmed a good new model related to strengths and virtues from the perspective of positive psychology. This model shows that college students' strengths and virtues can be identified as 13 important factors which are goal and confidence, social ability, conscientiousness, optimism, physical characteristic, intellectual ability, willpower, authenticity, traits of thinking, autonomy, considerateness, aggressiveness, and rationality.

As a college student, he/she can develop his/her positive personality traits in the light of this model. First of all, "setting a goal and boosting self-confidence" is the most critical strength for each college student. It is also one of the most important tasks to improve college students' sociability, to develop intellectual ability, to cultivate the optimistic attitudes, to train the traits of thinking, and so on. In a word, future study had better convert to the direction towards how to use this model as a valid tool for college students' growth.

Meanwhile, several limitations in this study deserve comment. Almost 29% of survey respondents described their strengths and virtues in inexact words. Furthermore, the interpretations to some similar positive personality traits are often confused. In addition, the size and structure of the sample still need to be standardized or optimized.

## Conclusions

In conclusion, this paper established a new model of college students' strengths and virtues by means of the data of large sample, several classic and traditional personality theories, and scientific statistical methods. This model can be confirmed to have good fit indices, thus it belongs to a valid and valuable model related to positive personality traits.

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# Emotional Perception of Urban Environments<sup>\*</sup>

Graciela Tonello

Universidad Nacional de Tucumán, Tucumán, Argentina

Pablo Bobatto

Universidad Nacional de Córdoba, Córdoba, Argentina

In the frame of a study aiming at identifying the potential of emotion as the affective component of perception, a questionnaire was developed for assessing the involvement of this dimension in the perception of urban environments. The questionnaire was tested in field studies carried out in two cities. It was hypothesized that the street lighting might be the main feature among the overall environmental stimulation of the urban environment, and this may have an impact on emotional perception. The general appraisal of the urban scene was also considered as background predictor.

*Keywords:* emotional perception, questionnaire, street lighting, urban environments

## Introduction

Environmental perception includes cognitive, affective, interpretive, and evaluative components. As opposed to sensation, the term perception is applied to the more complicated processing of complex, often meaningful stimuli like those encountered in everyday life (Bell, Greene, Fisher, & Baum, 2001). At the same time, the core feature that distinguishes moods from emotions is that moods, in contrast to emotions, are diffuse and global, being moods temporary dispositions to have or to generate particular kinds of emotion-relevant appraisals (Siemer, 2009).

From a neurobiological point of view, emotion involves the entire nervous system, being the limbic and the autonomic nervous systems, especially significant (Dalglish, Dunn, & Mobbs, 2009). But it is extremely difficult to find a case of pure emotion because in any normal situation, emotion is affected by appraisal. However, in some contexts, emotion can be seen as prior to cognitions (Franks, 2010).

Appraisal theory claims that emotions are elicited by evaluations (appraisals) of events and situations. The more controversial issues that appraisal theory must continue to confront and address, are the relative importance of appraisal vs. other factors in eliciting emotions. Three processes were suggested by appraisal theories as important for emotion perception: (1) the identification of the emotional significance of a stimulus; (2) the production of an affective state in response to 1; and (3) the regulation of the affective state (Phillips, Drevets, Rauch, & Lane, 2003).

According to Küller (1991), an emotion is not a state, but a process that evolves in stages, and proceeds in four steps corresponding to the neurophysiological events of arousal/activation, attention/orientation, reward/aversion (or evaluation), and coping/control. This so-called “basic emotional process”, will be repeated over and over again, as a response to changes in the human-environment relation. Although some basic

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Graciela Tonello, Ph.D., Departamento de Luminotecnia, Luz y Visión, Universidad Nacional de Tucumán.

Pablo Bobatto, E.E., Facultad de Ingeniería, Universidad Nacional de Córdoba.

emotional processes may take only seconds to complete, others may last for hours, days, or even years. The most human emotions constitute complex combinations of such basic dimensions, and they should be interpreted in a cognitive and contextual framework.

Environmental psychology has generally taken a dimensional approach to the study of emotions, considering human responses to environmental exposure through a holistic process (Laike, 2009).

Environmental stimuli such as light, noise, heat, air pollution, and crowding provoke greater stress when the individual is unable to cope with them. Real or perceived control over a stressor often causes fewer negative consequences than exposure to stressors that are uncontrollable. In addition, studies considered the possibility that environmental factors could trigger or increase stress symptoms in vulnerable persons (Tonello, 2008).

The luminous environment, specifically light considered as an emotional stimulus, might link together the neurobiological, the appraisal and the environmental approaches (Moruzzi & Magoun, 1949; Goldstein, 1996).

Antecedents about how street lighting affects people in an emotional broad sense are scarce, except in the case of the spectral power distribution of light sources on safety and visual perception.

Public lighting improves visibility and provides orientation. It also contributes to the perception of comfort and safety of people outside after dark. At present, high pressure sodium lamps are widely used in street lighting. This is in part due to their high efficacy and relatively long lifetime ( $\geq 16,000$  hours). Their use, however, comes at the expense of good colour rendering. Recently developed ceramic metal halide lamps provide many of the advantages of high pressure sodium light sources, in addition to white light and better rendering of colours (Knight, 2010).

MH (metal halide) lighting systems are gaining in acceptance relative to HPS (high-pressure sodium) lighting systems for many night time applications. HPS and MH installations were compared in terms of perceptions of brightness and safety, acceptability for social interaction, facial recognition and eyewitness identification. At equal photopic light levels, a street scene illuminated at night by an MH lighting system was reliably seen as brighter and safer than the same scene illuminated by an HPS system. In terms of acceptability for social interaction, facial recognition and many aspects of eyewitness identification, the measured differences between lighting systems were not as clear (Rea, Bullough, & Akashi, 2009). Further work is needed to determine how recognition of the identity and intent of other pedestrians is affected by lamp spectrum (Fotios, 2013).

### **Problem, Objective, and Hypotheses**

Urban users are exposed to a variety of environmental stimuli that are beyond their control, influencing their behavior and moods. Among them, light plays an important role by affecting fundamental aspects of life such as health, welfare and safety.

By means of two field studies, this research work aims to investigate the sensitivity of a subjective method developed to assess the emotional dimension of the urban environment perception in general, and particularly to identify whether street lighting has any influence on the emotional perception of urban users.

The typical bias of field studies that this work show can be overcome by means of its replication in experimental settings.

It was hypothesized that the perception of street lighting, specifically the spectral power distribution of the lamps, together with other environmental factors such as noise, odors, and pollution, and a general appraisal of the environment would have an impact on users' emotions.

## Method

### Sample, Setting, and Measurements

The study was conducted in the streets of the city centre of two medium sized Argentinean cities of 700,000 and 1,300,000 inhabitants, respectively. The four streets included in this study are considered equal in terms of importance and progress.

The sample was made up of 170 observers for the two cities. All the participants received oral and written instructions as well as information about the project as an investigation of people's perception of public lighting. Table 1 summarizes the characteristics of the two groups of observers.

Table 1

*Description of the Participants in the Two Cities and Streets*

|                             | City 1 | City 2 |
|-----------------------------|--------|--------|
| <i>N</i>                    | 70     | 100    |
| Metal Halide Street         | 30     | 50     |
| High Pressure Sodium Street | 40     | 50     |
| Gender:                     |        |        |
| Women ( <i>N</i> )          | 43     | 30     |
| Men ( <i>N</i> )            | 27     | 20     |
| Range age (years)           | 20-68  | 23-45  |

Participation was voluntary for both groups. The data collection took two weeks in both cities. In city 1 the sample was made up of workers belonging to retails along the investigated sidewalks, the questionnaires were delivered on Tuesday at 19:00 hours and collected the next day. In city 2, the sample consisted of pedestrians who filled in the questionnaires in situ. Both groups carried out the evaluations between the time of 20:00 and 22:00 of an unusually warm winter, during half an hour.

Physical measurements (see Table 2) were carried out at approximately the same time as the questionnaires were being filled in.

Table 2

*Mean Values of Vertical Illuminance, Noise, Temperature, and Humidity*

|            | Illuminance (lx) | Noise (db) | Temperature (°C) | Humidity (%) |
|------------|------------------|------------|------------------|--------------|
| MH city 1  | 23               | 80         | 23               | 57           |
| MH city 2  | 55               | 72         | 21               | 66           |
| HPS city 1 | 18               | 80         | 23               | 57           |
| HPS city 2 | 30               | 66         | 21               | 66           |

The streets were chosen because they were lit by different light sources, namely MH and HPS both lamps of 150 W in city 1, and 150 W and 70 W respectively in city 2. Figure 1 shows the spectral power distribution of metal halide (a) and high pressure sodium lamps (b), not measured on the field but from laboratory measurements of the light source.

Figures 2 and 3 show the four streets.

In city 1, the examined sidewalk belonging to the MH street lighting has a width of 3.80 meters, with a distance between the 6 meters high lamp-posts of approx. 20 meters.

The HPS lighting consists of one row of 7 meters high lamp-posts, placed every 26 meters along a narrow sidewalk of 2 meters.

In city 2, the MH lighting consists on high 4 meters posts placed every 15 meters across an area of 8 meters. On the other hand, the sidewalk of the streets lit by HPS lamps has a width of 11 meters, and since it corresponds to the pedestrian street of the city, the lamp-posts are placed into rounded stonemasons every 6 meters along the central line of the street. The height of the post is 4.5 meters and each one has four projectors tilted 45°.

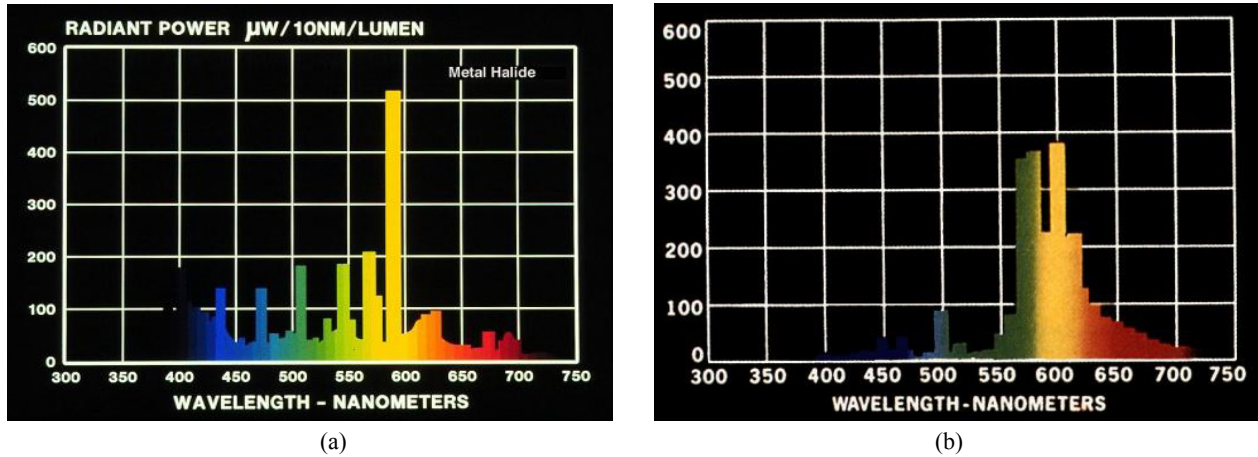


Figure 1. Spectral power distribution of metal halide (a) and high pressure sodium light sources (b).



Figure 2. Intersection of the two streets in city 1.





Figure 3. MH and HPS streets in city 2.

The lighting conditions on the four streets are described by averaging the vertical illuminance values measured to the four longitudinal and transverse directions on the sidewalk, at 1.50 meters, under and between the posts.

Lighting levels were according to the Argentinean norm IRAM AADL J2022-2.

As to perceptual measurements, the participants were asked to evaluate the street environment by means of a questionnaire specially developed to this purpose, which was divided into three sections:

The “general appraisal” was assessed on a three-grade scale ranging from “Not at all” to “Totally”, by the question: “Do the following adjectives coincide with your appraisal of this street? You can add more adjectives”.

The scales to assess “environmental factors” were developed in the Likert style, for example: “I can’t maintain a conversation due the noise level”. The respondents were asked to tick the appropriate box in a four-grade scale ranging from “Always” to “Never”.

The “emotional response” was analysed by means of a list of emotions expressing different reactions that a person might experience while looking at and walking along the street. Its four-grade scale ranged from “Absolutely” to “Not at all”.

### Data Processing

First, factor analysis of the emotional perception scales was made in order to confirm the factorial structure of the scales related to the basic emotional process and to explore positive and negative emotional dimensions as well.

One-way ANOVA (analyses of variance) were performed for the three sections of the questionnaire with the spectral power distribution of the lamps as independent variable or factor, in each city.

Also, indices for general appraisal, environmental factors and emotional perception were computed. The internal reliability of the indices was checked by Cronbach’s alpha.

Based on theoretical considerations, multiple regression analysis were performed in order to identify the predictive value of environmental factors, general appraisal, spectral distribution of lighting and city, on the emotional perception.

The analyses were carried out in SPSS (Statistical Program for Social Science) 15.0.

### Results

The factor analysis of the emotional scales resulted in four factors, accounting for 70% of the total variance (see Table 3). The first factor (22%) loaded high in negative emotions related to the basic emotional dimension of activation, this factor seems to be reinforced by the third factor (15%). The second factor (19%) represents positive emotions related to the basic emotional dimension of control, and it also seems to be reinforced by the fourth factor (14%).

The three sections of the questionnaires, namely general appraisal, environmental factors and emotional perception, as well as the indices computed for each one show high Cronbach's alpha coefficients: 0.94, 0.94, and 0.93 respectively.

An analysis of the significant scales of general appraisal shows, in general, a better evaluation for the streets lit by metal halide lamps (see Tables 4 and 5). In city 1, MH was evaluated in terms of: interesting, modern, stimulating, animated, stressful, pretentious, and repulsive. City 2 as inviting, interesting, luminous, airy, modern, original, spacious, formal, cool, well-kept, timeless, stylish, and expensive.

Table 3

*Factor Analysis for the Emotional Perception Scales: Rotated Factor Loadings (Varimax Rotation) Larger Than 0.50 Are Shown*

| Scales         | Factor 1 | Factor 2 | Factor 3 | Factor 4 |
|----------------|----------|----------|----------|----------|
| Hostility      | 0.677    |          |          |          |
| Familiarity    |          | 0.758    |          |          |
| Calmness       |          | 0.676    |          |          |
| Satisfaction   |          | 0.792    |          |          |
| Worry          | 0.791    |          |          |          |
| Sadness        |          |          | 0.752    |          |
| Friendship     |          | 0.684    |          |          |
| Curiosity      |          |          |          | 0.788    |
| Energy         |          |          |          | 0.698    |
| Boredom        |          |          | 0.781    |          |
| Seriousness    |          | 0.717    |          |          |
| Loneliness     |          |          | 0.672    |          |
| Safety         |          |          |          | 0.536    |
| Relaxation     |          |          |          | 0.561    |
| Alertness      | 0.800    |          |          |          |
| Anxiety        | 0.754    |          |          |          |
| Independence   |          | 0.513    |          |          |
| Smallness      |          |          | 0.603    |          |
| Tension        | 0.780    |          |          |          |
| Euphoria       | 0.534    |          |          |          |
| Altruism       |          | 0.700    |          |          |
| Aggression     | 0.702    |          |          |          |
| Total variance | 22%      | 19%      | 15%      | 14%      |

On the other hand, HPS lighting was rated in city 1 as serious, spacious, modest, and simple, while in city 2 as simple, dynamic, modest, encumbered, and repulsive.

Table 4

*Descriptives of Significant Rating Scales for General Appraisal for the Two Lamps MH and HPS in City 1 (1 = "Not at all"; 2 = "Somewhat"; 3 = "Totally")*

| Scales      | MH: <i>M</i> ( <i>SD</i> ) | HPS: <i>M</i> ( <i>SD</i> ) | <i>F</i> | <i>p</i> |
|-------------|----------------------------|-----------------------------|----------|----------|
| Serious     | 1.56 (0.5)                 | 1.95 (0.5)                  | 8.05     | 0.006    |
| Interesting | 2.10 (0.6)                 | 1.70 (0.6)                  | 7.43     | 0.008    |
| Modern      | 2.10 (0.7)                 | 1.57 (0.6)                  | 9.89     | 0.002    |
| Spacious    | 1.30 (0.4)                 | 1.70 (0.6)                  | 7.55     | 0.008    |
| Stimulating | 1.90 (0.8)                 | 1.37 (0.6)                  | 9.42     | 0.003    |
| Modest      | 1.40 (0.4)                 | 1.97 (0.6)                  | 15.94    | 0.000    |
| Animated    | 2.23 (0.6)                 | 1.62 (0.7)                  | 14.03    | 0.000    |
| Stressful   | 2.43 (0.6)                 | 1.87 (0.8)                  | 9.14     | 0.004    |
| Pretentious | 1.93 (0.6)                 | 1.35 (0.6)                  | 13.69    | 0.000    |
| Simple      | 1.60 (0.4)                 | 2.22 (0.7)                  | 15.09    | 0.000    |
| Repulsive   | 1.63 (0.6)                 | 1.20 (0.5)                  | 9.36     | 0.003    |

Table 5

*Descriptives of Significant Rating Scales for General Appraisal for the Two Lamps MH and HPS in City 2 (1 = "Not at all"; 2 = "Somewhat"; 3 = "Totally")*

| Scales      | MH: <i>M</i> ( <i>SD</i> ) | HPS: <i>M</i> ( <i>SD</i> ) | <i>F</i> | <i>p</i> |
|-------------|----------------------------|-----------------------------|----------|----------|
| Inviting    | 2.28 (0.6)                 | 1.76 (0.4)                  | 24.35    | 0.000    |
| Interesting | 2.20 (0.6)                 | 1.86 (0.5)                  | 10.11    | 0.002    |
| Luminous    | 2.32 (0.5)                 | 1.92 (0.3)                  | 26.92    | 0.000    |
| Airy        | 2.46 (0.5)                 | 1.92 (0.3)                  | 44.37    | 0.000    |
| Modern      | 2.40 (0.6)                 | 1.70 (0.5)                  | 39.36    | 0.000    |
| Original    | 2.04 (0.4)                 | 1.64 (0.6)                  | 13.31    | 0.000    |
| Spacious    | 2.36 (0.5)                 | 1.96 (0.6)                  | 13.31    | 0.000    |
| Formal      | 2.12 (0.3)                 | 1.62 (0.5)                  | 35.90    | 0.000    |
| Simple      | 2.04 (0.3)                 | 2.32 (0.5)                  | 9.23     | 0.003    |
| Cool        | 2.40 (0.5)                 | 1.78 (0.5)                  | 38.31    | 0.000    |
| Dynamic     | 1.88 (0.6)                 | 2.20 (0.6)                  | 7.54     | 0.007    |
| Well kept   | 2.64 (0.5)                 | 1.88 (0.3)                  | 84.23    | 0.000    |
| Modest      | 1.60 (0.5)                 | 2.04 (0.5)                  | 18.29    | 0.000    |
| Encumbered  | 1.92 (0.5)                 | 2.22 (0.6)                  | 7.80     | 0.006    |
| Timeless    | 1.96 (0.4)                 | 1.58 (0.6)                  | 13.55    | 0.000    |
| Stylish     | 2.16 (0.4)                 | 1.68 (0.5)                  | 26.13    | 0.000    |
| Expensive   | 2.04 (0.5)                 | 1.84 (0.5)                  | 11.59    | 0.001    |
| Repulsive   | 1.08 (0.3)                 | 1.48 (0.5)                  | 24.25    | 0.000    |

In city 1, the analysis of the significant scales of environmental factors shows a negative evaluation of the street lit by metal halide lamp in terms of unpleasant odors perception and a kind of relief while leaving this street. On the other hand, in city 2, the same type of light seemed to enhance walking.

In both cities, high pressure sodium lighting gathered negative scores since disorientation and a feeling of hurry were experienced in city 1. In city 2, the complaints about environmental factors included the lighting



level, insecurity, too much luminous advertisements, noise, irritability, bad odors, and feeling of hurry.

More positive emotions for the metal halide lighting were experienced in city 2 (calmness, friendship, curiosity, energy, boredom, safety, relaxation, and altruism) than in city 1 (curiosity, tension, and euphoria).

On the contrary, for the HPS lighting, more positive emotions were experienced in city 1 (calmness, loneliness, and relaxation) than in city 2 (hostility, worry, alertness, anxiety, tension, and aggression).

Table 6

*Descriptives of Significant Rating Scales for Environmental Factors for the Two Lamps MH and HPS in City 1 (1 = "Always"; 2 = "Sometimes"; 3 = "Rarely"; 4 = "Never")*

| Scales               | MH: <i>M</i> ( <i>SD</i> ) | HPS: <i>M</i> ( <i>SD</i> ) | <i>F</i> | <i>p</i> |
|----------------------|----------------------------|-----------------------------|----------|----------|
| Disorientation       | 3.93 (0.2)                 | 3.50 (0.8)                  | 7.85     | 0.007    |
| Odors                | 2.40 (0.8)                 | 3.00 (0.9)                  | 7.60     | 0.007    |
| Relief while leaving | 2.00 (0.9)                 | 2.65 (1.0)                  | 7.56     | 0.008    |
| Hurry feeling        | 1.73 (0.9)                 | 2.87 (1.0)                  | 18.93    | 0.000    |

Multiple regression analysis shows that 74% of the variance could be explained. The standardized beta-coefficients indicate that the environmental factors overall and the spectral power distribution of lighting within it, were the best predictors of emotional perception experienced by the observers.

Table 7

*Descriptives of Significant Rating Scales for Environmental Factors for the Two Lamps MH and HPS in City 2 (1 = "Always"; 2 = "Sometimes"; 3 = "Rarely"; 4 = "Never")*

| Scales                  | MH: <i>M</i> ( <i>SD</i> ) | HPS: <i>M</i> ( <i>SD</i> ) | <i>F</i> | <i>p</i> |
|-------------------------|----------------------------|-----------------------------|----------|----------|
| Low lighting level      | 3.08 (0.9)                 | 2.30 (0.8)                  | 20.65    | 0.000    |
| Unsafety                | 2.86 (0.1)                 | 2.22 (0.7)                  | 13.45    | 0.000    |
| Too much advertisements | 3.24 (0.1)                 | 2.36 (0.1)                  | 17.15    | 0.000    |
| Climate affection       | 2.50 (0.1)                 | 1.92 (0.1)                  | 7.62     | 0.007    |
| Noise and conversation  | 2.68 (0.1)                 | 1.78 (0.1)                  | 21.70    | 0.000    |
| Noise and sickness      | 3.52 (0.1)                 | 2.68 (0.1)                  | 18.13    | 0.000    |
| Irritability            | 3.16 (0.1)                 | 1.62 (0.1)                  | 61.17    | 0.000    |
| Odors                   | 2.84 (0.1)                 | 2.16 (0.5)                  | 17.86    | 0.000    |
| Walk                    | 1.22 (0.4)                 | 2.18 (0.8)                  | 51.36    | 0.000    |
| Hurry feeling           | 2.82 (0.8)                 | 2.48 (0.1)                  | 72.11    | 0.000    |

Table 8

*Means of Significant Rating Scales for Emotional Perception for the Two Lamps MH and HPS in City 1 (1 = "Total"; 2 = "Moderate"; 3 = "Slight"; 4 = "Null")*

| Scales     | MH: <i>M</i> ( <i>SD</i> ) | HPS: <i>M</i> ( <i>SD</i> ) | <i>F</i> | <i>p</i> |
|------------|----------------------------|-----------------------------|----------|----------|
| Calmness   | 3.60 (0.6)                 | 2.85 (0.9)                  | 13.57    | 0.000    |
| Curiosity  | 2.06 (0.9)                 | 2.87 (0.9)                  | 11.85    | 0.001    |
| Loneliness | 3.56 (0.8)                 | 2.80 (1.1)                  | 9.54     | 0.003    |
| Relaxation | 3.73 (0.5)                 | 3.05 (0.9)                  | 13.03    | 0.001    |
| Tension    | 2.10 (0.9)                 | 2.82 (1.0)                  | 8.94     | 0.004    |
| Euphoria   | 2.60 (1.0)                 | 3.35 (0.9)                  | 9.89     | 0.002    |

Table 9

*Means of Significant Rating Scales for Emotional Perception for the Two Lamps MH and HPS in City 2 (1 = "Total"; 2 = "Moderate"; 3 = "Slight"; 4 = "Null")*

| Scales     | MH: <i>M</i> ( <i>SD</i> ) | HPS: <i>M</i> ( <i>SD</i> ) | <i>F</i> | <i>p</i> |
|------------|----------------------------|-----------------------------|----------|----------|
| Hostility  | 3.26 (0.9)                 | 2.70 (0.7)                  | 11.28    | 0.001    |
| Calmness   | 2.64 (0.9)                 | 3.32 (0.9)                  | 14.09    | 0.000    |
| Worry      | 3.08 (0.7)                 | 2.52 (0.7)                  | 13.68    | 0.000    |
| Friendship | 2.00 (0.8)                 | 2.50 (0.7)                  | 10.12    | 0.002    |
| Curiosity  | 2.00 (0.2)                 | 2.52 (0.9)                  | 14.25    | 0.000    |
| Energy     | 1.90 (0.5)                 | 2.36 (1.0)                  | 8.09     | 0.005    |
| Boredom    | 2.80 (0.7)                 | 3.30 (0.9)                  | 8.69     | 0.004    |
| Safety     | 1.92 (0.6)                 | 2.62 (0.5)                  | 30.42    | 0.000    |
| Relaxation | 2.02 (0.4)                 | 3.32 (0.7)                  | 109.36   | 0.000    |
| Alertness  | 3.04 (0.7)                 | 2.36 (0.6)                  | 22.91    | 0.000    |
| Anxiety    | 3.20 (0.4)                 | 2.56 (0.9)                  | 19.18    | 0.000    |
| Tension    | 3.04 (0.9)                 | 2.48 (0.9)                  | 8.89     | 0.004    |
| Altruism   | 2.56 (0.8)                 | 3.26 (0.7)                  | 18.21    | 0.000    |
| Aggression | 3.68 (0.6)                 | 2.92 (0.8)                  | 22.62    | 0.000    |

Table 10

*Multiple Regression Analysis for Emotional Index as Dependent on Environmental Factors, General Appraisal, Spectral Power Distribution of Lighting and City*

| Variables entered     | Emotional perception |            |      |          |          |
|-----------------------|----------------------|------------|------|----------|----------|
|                       | <i>B</i>             | Std. Error | Beta | <i>t</i> | <i>p</i> |
| (Constant)            | 0.52                 | 0.16       |      | 3.29     | 0.001    |
| Environmental factors | 0.65                 | 0.04       | 0.79 | 13.90    | 0.000    |
| General appraisal     | 0.16                 | 0.10       | 0.09 | 1.61     | 0.107    |
| Spectral distribution | 0.21                 | 0.04       | 0.19 | 4.72     | 0.000    |
| City                  | 0.01                 | 0.05       | 0.00 | 0.20     | 0.839    |

Notes.  $R = 0.86$ ,  $R^2 = 0.74$ ,  $R^2_{adj} = 0.74$ , and  $p < 0.001$ .

## Discussion

There is no greater exposure than that of urban users in the sense of the complete lack of control of environmental stimuli that impinge on them. Environmental variables such as lighting and noise may affect people's health in a non-auditive and non-visual way (Hygge, 2002; Küller, Ballal, Laike, Mikellides, & Tonello, 2006). Nevertheless, many studies on the effects of environmental variables are often carried out on risk communities such as factories or people living close to airports or highways (Evans, 2000).

Beyond vision, light affects people in different ways. Antecedents about how the lit space is captured by observers are well documented and highly inspired by Flynn's protocols (Flynn, Hendrick, Spencer, & Martyniuk, 1979). As to street lighting, studies about how people are affected in an emotional broad sense are scarce, except for the case of spectral power distribution of light sources and illuminance levels over safety or fear of crime and visual perception (Boyce, Eklund, Hamilton, & Bruno, 2000; De Kort, 2012; Johansson, Rosén, & Küller, 2011; Fotios, Cheal, & Boyce, 2005; Di Laura, Houser, Mistrick, & Steffy, 2011).

The main aim of the present paper was to investigate the perception of the urban environment from an emotional approach by means of a questionnaire specially developed for this purpose. Attempts at conceptualizing and measuring emotions have been controversial, but there is a general agreement that in contrast to emotions, moods are considered temporary emotional dispositions-relevant appraisals. Since the most human emotions should be interpreted in a context and environmental psychology has generally taken a dimensional approach to the study of emotions, in this study, the luminous environment linked together the appraisal and the environmental approaches.

Thus, in order to investigate the emotional perception of the selected urban environments, it was assumed that light would be the most important factor in the environmental stimulation pattern, and this was specifically investigated by means of one of the main features of street lighting such as the spectral power distribution of the light sources. Also the general appraisal of the streets was taken into account as predictor.

Because of the fundamental role of emotions as mediators of environmental assessment, they are often confused with environmental descriptors. In this study, the three indices related to general appraisal, environmental factors and emotional perception, each showed a high internal reliability and the results were easy to interpret in relation to the hypotheses. It was shown that environmental conditions affected people's emotional perception, and that lighting had an especially significant impact on the participant's emotional status. General appraisal resulted not relevant as predictor, as well as the city itself.

Generally speaking, metal halide lamps gathered the best evaluations in evaluative terms, while high pressure sodium lighting was rated by means of neutral descriptors.

The exception was the strong adjective "repulsive", which was used in city 1 for MH lighting and in city 2 for HPS. Although this was a field study, the existence of a considerable number of other light sources present on the environments may also have affected the spectral power distribution perceived by the pedestrian.

Environmental factors were perceived in both cities and for the two types of light source, in a high negatively way, especially in city 2 for the HPS light, which corresponds to the pedestrian street of the city, the complaints were stronger.

By means of factor analysis of the emotional scales four factors were obtained, two of them were related to dimensions of the basic emotional process, namely activation and control. The other two factors seemed to reinforce the former by means of positive and negative emotions. Taken together, the streets lit by metal halide were evaluated significantly different in terms of more positive emotions, especially in city 2 than in city 1. On the contrary, for the HPS lighting, more positive emotions were experienced in city 1. In line with the environmental outcomes, it seems to be that, again, the status of the street in city 2 (pedestrian) was more relevant than the type of lighting.

Multiple regression analysis showed that environmental factors overall and lighting were the best predictors of the emotional perception experienced by the observers.

Visual properties seems to be more related to affective appraisals (Hanyu, 1997), but the identification of the emotional significance of lighting implies taking into account the whole situation. The greater the separation between light as the stimulus and the desired response, the more likely it is that other factors are operating at the same time across several sensory modalities in the production and regulation of an affective state.

In conclusion, in spite of human emotions influenced by a number of factors and due to difficulties inherent in field studies, the present study was able to show that the strongest impact on emotional perception

emanated from the environmental conditions and from lighting as part of it.

Finally, it could be concluded that the reliability of the subjective technique developed in this study was fairly satisfactory.

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# The Building of Gender Identity From the Resilience Concepts

Angélica Flores González, Sandra Carina Fulquez

Autonomous University of Baja California, Baja California, México

The study focuses on the construction of the identity of women participating in a productive program in the Mexicali Valley in Baja California State, Mexico, in situations of violence, from the processes and contents of the resilience approach. Manifest feminine gender as anchor a narrative between their individual identity and social identities intergeneric culture is created and accumulated from codes of gender, to be recursively taught in socialization; derived from them, develop processes of inclusion/exclusion, so that memory is the result of the historical relations of power. However, we noted that the power to deal with problematic or adverse situations responds to different ways that lead to having different styles of coping. From resilience capacity to deal with situations of aggression (psychological, economic, or physical), it gives meaning, valuation, and resignification to experience in the past, from this, it is that it retrieves your identity empowerment, motivational and entrepreneur in the productive area.

*Keywords:* identity, gender, resilience, empowerment

## Introduction

How is the identity of a woman who has been through violence for many years constructed? What are the factors that contribute to become and develop a resilient being? How can we empower women so that they have a place and a fair distribution of resources (material and symbolic) and that they are recognized by themselves?

The identity is a process that is constructed through speech and social practices. It is essential to understand the phenomenon of violence against women, since the process of construction of identity is always given within a framework of social representations which, in the case of the battered woman, is part of a long historical way of inequality of gender, founded in the androcentrism and sustained from the patriarchy.

It is not easy to speak of violence, since it is a phenomenon of countless edges, it may be for this reason, it is the most serious problem causing us to when you want to restrict it and try to qualify it or quantify it, as if the violence was only “a” and had “entity”.

Our reality is plagued by violence, at the level of events and actions, such as armed conflict, crime, kidnappings for ransom and terrorism, among others, as well as to level of certain logics and mechanisms, such as impunity, the handling of information, certain functionality of myths and stereotypes, empty, “violent”, among other laws.

All this, without a doubt, establishes a fertile ground so that through certain joints can develop, for example, the phenomenon of domestic violence.

This phenomenon is complex and multifaceted. One of the most difficult and challenging tasks is to break

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Angélica Flores González, Ph.D., Social Service Department, Autonomous University of Baja California.

Sandra Carina Fulquez, Ph.D., Laboratory of Basic and Applied Psychology, Autonomous University of Baja California.

down the different forms of violence to better understand its characteristics, causes, and consequences. Violence can be categorized according to different variables: individuals who suffer violence: women, children, youth, elderly, and disabled; the agents of violence: gangs, drug traffickers youth; the nature of the aggression: psychological, physical, sexual, financial, and environmental; the reason of aggression: political, racial, economic, instrumental, and emotional; and the relationship between the subject who suffers and which exerts violence: relatives, couples, friends, known-called domestic violence—and that occurs between subjects that are not related in this way, called social violence. Domestic violence usually takes place within the confines of the home, while social violence usually occurs in the street or public places and is, in consequence, more visible.

Violence against women is any act of violence based on membership of the female gender, which has or may have as a result harm or physical, sexual, or psychological suffering to women, as well as the threats of such acts, coercion or arbitrary deprivation of liberty, whether occurs in public as in private. The difference between this type of violence and other forms of aggression and coercion is that, in this case, the factor of risk or vulnerability is the mere fact of being a woman.

In Mexicali Valley, a rural-urban region with significant agricultural export economy, border with California and Arizona is an important social problem and few data indicates that measures taken by the legal system are insufficient. From different fields, it comes out an attempt to address the phenomenon of gender-based violence, considering that they are different types of factors that contribute to the emergence of this fact. Sometimes, it tends to justify violence against women by appealing to possible mental imbalances of the offender; however, we believe that there is, along with the psychological factors of the victim and the aggressor, another type of social factors that significantly influence the violent actions.

However, the objective of this work consists in reflecting on the factors that have an impact on the resilience and contribute to give a new meaning sense of identity in women, in terms of overcoming personal and productive

Some of the issues around which we develop this work are: How to build the process of identity in battered women and what their identity elements? How same these women and what is the definition given by others? How does the recognition game? How would like to be seen by others? In what aspects are identified and what is the difference between?

### **The Concept of Identity**

The gender role socialization occurs through learning, this being the medium to transmit values, attitudes, and rules. In this sense, since the childhood gender stereotypes are developed, and a boy or a girl, crystallizes in the mode in which the parents consider how should behave. Here the learning process plays an essential role. From the social cognitive theory, it can be said that gender identity is constructed through the cognitive processing of experiences, learning about social roles for each sex and norms are to dominate the type of behavior typical of their sex. This is how acts according to the socially pre-established scheme. The gender role is developing along the evolutionary development of the child and children begin to imitate and to choose models, so that at the age of 5-6 conform to types of masculinity and femininity; at age 8, the position is more liberal and sexual differences are increased to 10 years. Later, in adolescence, they establish a personal identity and stereotypes are accepted. If we differentiate by gender we can highlight, on the one hand, girls, to be near his mother, learn the features of personality, attitudes, values and maternal roles to affective and personal ties.

Thus, the role of feminine gender is constituted by stereotypes as passive, tender, submissive, compliant, vulnerable, and dedicated to the care of others. Women who fit these stereotypes perceived the men as signs of power and authority, and the small child is identified with the role and traits of the father. Masculinity means denying the relationship with the mother and has this universal element of the male role. The result will be social roles abstract and impersonal. Men associated are stereotyped behaviors, competitive, aggressive, high degree of demand for success, wisdom, courage, and knowledge control. It is then when adapted to the gender stereotype good man perceives women as weak and hostile.

Therefore, we can conclude that, in the construction of gender and socialization processes, the family is the benchmark that new members are to be identified. Adults influence the processes of identity both the boy and the girl. Very small parents transmit gender patterns and treat the children differently from girls.

However, we cannot ignore that there is another factor of interest in this process: enthusiasm media that promote the configuration of gender stereotypes, exhibiting both images that socially devalues the woman as images that reinforce the qualities of power, productive work, decision-making, and self-reliance in men.

Ultimately, socially it prepares men for a dominant role, and if they do not consequent, they seek to obtain it by force; for them, violence is a means of controlling women. The socialization makes men a role based on the power, authority, and in the domain; and women in purely female roles as sweetness, and the expression of the emotions. Hirigoyen (2006) has stated about Pierre Bourdieu: "Everything is courageous, respectable; worthy of admiration is of order masculine, while weak, insignificant or unworthy belongs to the female register".

Identities are constituted within and not outside representation and are related with the tradition and the invention of tradition, we can say that the identity is a representation through which subjects are recognized if, classified the world and are located in it. It is a social construction, therefore, it will have disputes of meaning, determining elements, use of power, delimitation, exclusion, identification, and social imaginary.

Therefore, the identity is a relational concept, which to build will need the presence of another which settles an approximation or similarity, but also a distinction.

One of the important elements in the configuration of the identity is recognition games. These are not anything other than power relations with the attributions of identity imposed on the other. To establish through a relational system, we can say that the identity is internally and externally.

In the case of a group of women struggling to assert their rights, for example, another can do external group censorship and this absorbs it according to the force having these games. The more consolidated is the group; more force will have to impose their identity.

Awards games can be instituted through the language, the media, at the legal level through laws, among others, reflecting the social recognition for example having this group of women.

It is important to clarify that there is no identity, but there are many identities. It is to say that the same subject has the ability to assume different identities, depending on their position and according to the situations with which it has to face.

### **Resignification of the Identity of Gender From Resilience Capacity**

Suarez (2004) has mentioned a term that comes from physics, the ability of a material to recover its original shape after stay under high pressures. By analogy, in the human or social sciences, people began to use this word to designate the human faculty that allows people leaving secure and safe experiences and adverse situations.

According to Beltran (2006) and Werner (1989), investigations carried out from the 1970s onwards, were the certainty that it is possible to promote resilience as a mechanism of prevention in mental health and social ability to cope with the adversities of life.

Now, to get successful results when working the resiliency, as well as keep in mind which is not an absolute or stable concept, it must take into account intrinsic factors (internal) and extrinsic (external) the own individual. On the one hand, internal factors are the different reactions of people in different circumstances, personal characteristics associated with the temperament, personality, character and tolerance for frustration, the mode of conflict resolution, cognitive experience, and assertiveness, also, referring to having a sense of humor, being sociable, having high self-esteem and internal control problems, seeing positively the future, being flexible and adapt, among others. The external factors are those situations that may or not generate stress, relating to the characteristics of the environment of the person: family, social, relationship with peers, etc.. It could also be the environment values, encourage people and education is promoted, there are relationships of support, responsibilities are shared, promoted the achievement of goals, among others. Then, you could say that resilience is a set of features that result from positive interaction between the personal and environmental component of a person.

With the implementation of the project on resilience and its pillars (based on the internal and external factors) in the group of mutual support, we have tried to provide a new way for the interpretation of the different situations that have lived the women in situation of violence, allowing this way that they focus on their potential, according to the environment in which they live and not in its limitations. The importance of this process is having the option to see themselves as owners of your life, with the possibility of taking decisions aimed at the goals proposed.

According to Vanistendael (1995), resilience has components and pillars that are essential for determining whether a person is resilient. Two of these components are resistance: occurring against the destruction in order to protect the own integrity under pressure, and the ability to build positively: which occurs despite difficult circumstances. Another important component is the self-esteem, because it is based on the large number and variety of thoughts, feelings, experiences, experiences, and feelings that have accumulated over the life of the people.

In practice, it has been seen that self-esteem is a cornerstone for the development of resilience, since it is from this self-love that is a person more “easy” through adverse situations, without being influenced by what happens to its around.

### **Resilient Personal Characteristics (Wolin, Sybil & Wolin, Steven, 1999)**

Introspection: is to have the ability to ask itself and given an honest answer; taking a meaning of stress situations.

Independence: is the ability to establish boundaries between oneself and adverse environments, showing the ability to maintain emotional and physical distance without reaching isolated.

Ability to relate: is the ability to establish satisfactory and intimate bonds with other people, swinging with the own need of sympathy and willingness to provide others.

Initiative: is to have positive outlook setting goals possible to achieve, in relation to their abilities and with the environment.

Sense of humor: is the balance between a cheerful behavior (playful), the environment and the critical



capacity of the person, to sizing problems.

Creativity: the ability to create order, beauty and purpose from the chaos and disorder.

In childhood the creation is expressed in the games, which are the ways to reverse the loneliness, fear, rage and despair.

Morality: is the desire of a personal life satisfactory, pleasant and with inner wealth.

The women of the mutual support group who have had the opportunity to participate in the project of resilience, have been able to identify some of these features in their personal lives such as humor, resistance, the ability to relate, the importance of improving their self-esteem. To recognize them has been able to attribute more power to its capabilities and downplaying their limitations, feeling capable of coping with the difficulties that they face.

According to Indaburu (2004) Rogers (1951) has referred to important components such as emotional support, which represents the changes that come with a positive attitude, a comprehensive climate of sympathy and stimulation, as well as social support networks, understood as a process of permanent building both at the individual level as collective, considering it as an open system, whose dynamic exchange between its members enables the potentiation of the resources you have. In this system, there should be understanding, tolerance, respect and acceptance.

Moreno (2002) has found that the above issues are related somehow the concept of social capital, because it is a concept that synthesizes a set of values that are generated as a social whole, ability to work in groups and organizations to achieve common goals. It is a natural resource that increases when used, contributing to create social value and optimize the benefits of physical and human capital. What is an important factor of development is based on cultural roots and social virtues of individual.

It is also from the social capital that you can create and promote strong enough social and emotional support networks to develop people and resilient communities. In mutual support groups so that intervention is complete, in addition to working in internal (such as self-esteem, mood, etc.) aspects, also works on factors community as community participation, economic diversity, leadership, knowledge of laws and rights (human and women), among others, through training conducted by the team of coordinators. In this way, it contributes to the formation of resilience in a complementary manner, thus emphasizing the importance of work both at the internal factors and external people.

But also to develop the aspects mentioned above—either individually or in a group—it is important to build on the culture because it is a powerful instrument that shapes the personality of men and women through their prejudices, myths, customs, beliefs, and traditions, which operate as parameters of behavior and that influence social representations and the way of reasoning of the members of a community.

You can use these aspects are positively to create appropriate behaviors favoring women, but also to the social whole.

Now, one of the behaviors learned culturally, is precisely the violence and takes this community shape especially in the first years of life, the family, the school. But if it is learned and not instinctive, you can unlearn it is.

### **Discussion**

As a professional intervention strategy, our team decided to form a self-help group, under the joint coordination of a psychologist and a sociologist, both knowledgeable of the subject. The criteria to attend the

group are: (1) being female; (2) becoming a victim of family violence; (3) voluntarily attend; and (4) having an interview with sociologist and psychologist.

One of the characteristics of this group is its openness and flexibility. To get a woman victim of violence joins the same, previous individual interviews. A rather heterogeneous group in terms of the ages of women, education, civil status, and socio-economic level of the same is forming in this way.

Professional intervention techniques used are various. To begin with, in every meeting used relaxation techniques, so that women can disconnect from their everyday problems and in this way contact with themselves, with their emotions, with their bodies, and with they being more intimate. For this is the room in the dark, made to lie on the floor, shown them that they have to stay with your eyes closed, puts on a very soft background music and begins to work with breathing exercises and visualization. The exercise lasts approximately 25 minutes.

Another technique used is the reading of texts, from which are allusive to the subject of family violence to stories, poems, reflections, and even cards that they themselves write or have written at some time. The aim is that each can think through these texts, as a message, learning, or moral.

Also it used the technique of brainstorm of ideas which they are bringing through a phrase that serves as a trigger. The music is very important, since not only is it used for the exercises of relaxation and visualization, but also to do some body expression exercises. In addition, of course, it used interview technique in depth. The meetings are very intense and emotional, given that there women tell their stories of life, moving and disturbing.

Some women at the beginning cannot tell their stories and this is mainly due to two reasons: feeling shame or going through an emotional crisis that only allows them to express themselves through the tears. However, others have the urgent need to be heard, so they begin to tell their stories of life without any difficulty.

### **Process of Construction of Identity**

We would see how same women in the group and what is the definition given by others. An interesting question in the group is the fact that the self-definition of these women is fully conditioned and determined by the definition attributed by their partners. The fact that the aggressors permanently exercised psychological violence towards them, assuring them on a daily basis over many years that are calibrated, whores, old, fat, mad, sick, useless, guilty, among other epithets, ends these self-convinced women victims of abuse that this is as well. The speech of the aggressor is building the identity of the victim in a subtle and unconscious way. The victim internalizes this speech and plays it in his own daily practice as if it were what the speech said it was.

The over determination on these women, that the aggressor carried out through this everyday speech, is reinforced and justified by the lattice of myths, beliefs and speeches socially constructed around the female gender. The subordination of women has been historically conditioned by this definition attributed by the male, which has its base in patriarchy and the androcentrism. The male is strong, who dominates the head of the family, and does not cry or show emotions. The woman is attentive, obedient, sacrificed, gives everything for others, follows her husband “until death do part them”, sometimes literally, waiting to “perform” a prince charming.

This is all an order symbolic, ideological, socio-cultural, and historically constructed from the power attributed to men and which allows them to reproduce a model of thought installed on politics, religion, philosophy, science, the economy, and social media, that on a daily basis playing as “natural” image of women

less than men, pleasure object reduced only to your body or just certain parts of the same, housewife, cooking, being in charge of the children, secretary, always employed male or located behind it. The phrase “behind every great man is a great woman” reflects this situation of historical subordination of women.

Our self-help group women are not alien to this whole process of naturalization of the subordination of women. On the contrary, this social imaginary is reinforced by the cycle of domestic violence and the kind of emotional bond that these women have with their partners or offenders. In this sense, the discourse that constructs identity does not come a stranger, but the person who they have chosen as a partner to form a family, to have children, for “life”, as they repeat and repeat in the group.

How realizes game of recognition by the other in these women? If in the everyday life of any person the other censorship is significant and affects one way or another, in the case of these women victims of abuse, the other is strongly reduced to the mere presence of the offender, since they are in a situation of isolation and are at the mercy of their partners. One of the characteristics of domestic violence is that the aggressor gradually isolates women, first of their social environment and after her family of origin and his closest friends, in order to control and easily manipulate their victim.

The aggressor is only another, the only reference for the recognition of these women. The recognition game boils down to a game of manipulation, since unlike the processes of construction of identity which sets this game of recognition between subject, in the case of situations of violence in general, there is a relationship from subject to subject, but from subject to subject, marking this a clear distinction and peculiarity that distinguishes this type of system of social relations. This is not sufficiently developed in the theory and deserves a more comprehensive analysis, enabling you to have more elements for understanding and professional intervention in this field of reality for the future.

The self-help group is necessary to other references that contrast this image that women have of themselves and this is where our work becomes necessary in this process of deconstruction and reconstruction of identity, intervene in this everyday life and life experience, to—from here—help to modify it.

How would like to be seen by others these women? To go to the self-help group, these women are showing a desire to change their situation. The instance appears as a place of containment, a support, a means to find out or solution to your problem. The group is for these women the only space where they can speak of themselves and recognize each other as women. It is for the vast majority the only place that they have to interact with others, given the situation of isolation that are and that we described above.

Fear is a significant identity element in the women of the group. He is not only fear, but many fear or, better yet, fear of many different things. This point unites them, but also is different.

From where originate these fears? In general, originate from their life stories; these women have one of the features of the syndrome of abused women, which is learned helplessness. It is a situation where women learn to be helpless, as is taught that she is weak, vulnerable, inferior, incapable and that only can defend someone strong and superior. This strength and superiority are embodied in the figure of the male: the father, the brother, and the couple. They are responsible for raising their children in this order, making the difference between his sons and his daughters' women, thus reproducing the learned model.

This state of learned helplessness generates feelings of guilt, fear and low, self-esteem. These three elements—the guilt, fear, and low self-esteem—paralyzed so the woman victim of violence, that makes her unable to see a way out and break the circle of violence where. These three elements interact between if feeding each other, and therefore, constitute the basement where it is held and crystallizes the catatonic state and

numbness that is, inert and unarmed, the battered woman.

The blame is another significant identity element in the women in the group. As with fear, women express different feelings of guilt.

Low self-esteem is another significant identity element in the women of the group. As indicated in its etymology, the word self-esteem refers to the assessment that one has of itself. This assessment is built from the look the other and look towards one's self from childhood and usually in a household. The stories told by the women of the group realize that they have come to form partner with an image quite poor themselves, which it reinforces and further degraded in the couple's relationship with insults, humiliation and qualifiers who suffer on a daily basis.

As a result of this psychological and emotional violence, many women have tried to commit suicide when they reach the limit lower self-esteem, when they believe that their life no longer has any value or felt. For many women, death is the only way that comes for your situation.

In our case, the women in the group build its "nosotras (ourselves)" in the group, looking to be seen simply as women, not as objects of domination and manipulation by their partners, not as calibrated, whores, old, fat, mad, sick, useless, or guilty.

### **Mechanisms of Cohesion as a Configurative Element of Identity in the Group**

A mechanism of cohesion that arises in the group is the explicit agreements of watch is during holiday recess of the work team, and swap their addresses in order to not lose the contact between them and have someone with whom to speak and to whom appeal if you feel sad, alone or in a threatening situation. This mechanism has a sense of protection and solidarity network and demonstrates the need to continue to exist as a group, regardless of the circumstantial physical place that unites them until that time. It is a mechanism that expresses the sense of belonging and identification as a group.

Another mechanism of cohesion is that each member, including coordinators, expressed with words their experience in the group and count what served you, what are your wishes for the future, what she learned during this time, what things you would like to change and what things, and how they feel and all that want to say at this time. This mechanism shows the sincerity and the degree of affection generated in the group.

During the process of recovery of self-esteem and overcoming of fear and guilt, women show their mood with various symbols: clothes, makeup, hairstyles, attitudes, walk, smile, the tone of voice, the job search, the start of courses, among others. These symbols express the new look that acquire respect to themselves and others: see as a woman and value as a human being. In addition, they reflect that there is a new definition and recognition as constituent elements of the self.

### **Identification and Differentiation in the Group**

Identification is approaches and intersections, emphasizing the processes of similarities that articulate ties of solidarity and partnership based on the recognition of a common origin or shared with other individuals or groups, or with some ideal characteristics, but which in turn implies a set of differences, discursive work, marking, fixation of symbolic boundaries, and border effects production.

The group of women provides an identification process based on their common origin as battered women and characteristics shared in terms of discourse and the attitudes of their respective aggressors. These similarities are however different life stories that emerging from the stories. Articulated ties of solidarity and alliances among the women of the group, create a real network of mutual aid through the exchange of favors,

medicines, clothes, or money. But also, this process of identification involves differences, for example in what makes the continuity of the partner link. Some women expressed their desire to continue holding the link or retrieve it. Others, however, want to dissolve it definitively.

Another difference is that while some expressed the desire not to have any kind of relationship with another man anymore, others are betting the couple, love, thinking about remaking their lives one day. In fact, during the course of the group process some women engage in new relationships with other couples.

### **Empowerment**

How can empowerment be defined? The methodology that we use—experiential methodology—is designed to activate within the person aspects of cognitive, emotional and attitudinal to auto generate that change, because it is not something that can be imposed or granted, but must move the person inside. We believe that it is a learning process, with a way to go and a starting point, although we do not believe have arrival point since it works as a spiral that is developing new levels of awareness and exercised a power of resonance in immediate contexts, as we have seen. It has a subjective dimension that makes it very important, called “power in”.

According to Sharma (1991-1992), it is the power that allows developing self-esteem and the confidence to change the situation of subordination. We believe that we must redefine aspects as the value, self-efficacy. The term empowerment refers to a range of activities from individual self-affirmation to the collective resistance, and mobilizing to challenge power relations. It is thus a process oriented to change the nature and direction of the systemic forces that marginalize women and other sectors at a disadvantage in a given context.

It is multidimensional, composed of a range of interdependent factors. According to Kabeer (1999), there are three fundamental dimensions for empowerment: agency, resources, and achievements. “Resources” are running the conditions to make possible the empowerment, the “agency” refers to the same process, the capacity of action of women, and the “achievements” refers to the results of the process. Mora’s (2006) has found that each of these dimensions is elements of the same process, so we must analyze them interdependently, by implications that have with each other.

Rowlands (1995) has found that it works on different group scales: personal, interpersonal, or both. Finally, we intend to activate change processes that generate a new notion of power, opposed to power in “masculinizadas (masculinization)” societies, a democratic and shared power. The definitions of empowerment are not met, as well as its consequences. Advances in conceptualization have meant the pursuit of holistic empowerment strategies, and thereby have emphasized that there is no magic formula or foolproof design, that there is no single recipe or prescriptive model. Disciplinary studies (Peled, Eiskovitz, & Enoch, 2000) show that their approaches are still sometimes ideological and prescriptive rather than descriptive and practical what constitutes a challenge continue placing under the umbrella of this approach to redefine the unequal relations between women and men to build a more just society.

### **Conclusions**

Identity is a relational concept, and it needs the presence of another which settles an approximation or similarity, but also a distinction.

The importance should be put on resilience and empowerment in abused women.

How abused women managed to advance and empower themselves in a self-help group should be paid attention to.

The project was seeking to recover the identity gained from a group of women in situation of violence resignifying their gender identity.

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# Rating Score Data Analysis by Classical Test Theory and Many-Facet Rasch Model

Tsai-Wei Huang  
National Chiayi University,  
Chiayi, Taiwan

Gwo-Jen Guo  
National Changhua  
University of Education,  
Changhua, Taiwan

William Loadman  
The Ohio State University,  
Columbus, USA

Fang-Mei Law  
Tiffin University, Tiffin,  
USA

More and more judgments conducted by raters are involved in psychological and educational assessment and testing situations. Two measurement theories, CTT (classical test theory) and MFRM (many-facet Rasch model), were implemented in the analyses of rating scale data. Parameters of item difficulty, item discrimination, and reliability were compared between CTT and MFRM. One hundred and twenty-four applying proposals were evaluated by 64 raters on a 24-item rating form. The results showed that item difficulty indices estimated by CTT and by MFRM were highly consistent, but item discrimination indices were remarkably uncorrelated. The values of reliability provided by CTT and MFRM were very consistent.

*Keywords:* rating score, classical test theory, many-facet Rasch model

## Introduction

Recently, more and more judgments conducted by raters are involved in psychological and educational assessment and testing situations (Han, Kreiter, Park, & Ferguso, 2006; Angkaw, Tran, & Haaga, 2006; Wilder, Braaten, Wilhite, & Algozzine, 2006; Holmberg, de Geer, Swärd, & Fernell, 2004; Kulinna & Zhu, 2001). In some educational situations, as teachers need to evaluate students' performance through some tasks, the scores would involve at least three facets, the rater (teachers), the examinee (students), and the task (test). In this case, raters need to judge the optimum of answers provided by examinees, and scores earned by examinees are based on the judgments of raters. Obviously, it is not appropriate to assess the students' performance only through the examinee and item facets and ignore the influence of raters' leniency/severity on examinees' scores as we interpret in multiple-choice tests. Therefore, some item characteristics such as item difficulty, item discrimination, and even test reliability are highly correlated with raters' judgments. However, many conventional analyses discard the effect of the raters and simply focus on the interaction between examinees and tasks. The factor of rater indeed needs to be taken into consideration in item analysis. Thus, the main purpose of this study intends to compare item characteristics on rating scores between CTT (classical test theory) and MFRM (many-facet Rasch model).

## CTT

CTT is well known more than 150 years. It has contributed to three remarkable measurement

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Tsai-Wei Huang, professor, Department of Counseling, National Chiayi University.

Gwo-Jen Guo, professor, Department of Guidance and Counseling, National Changhua University of Education.

William Loadman, Faculty Emeritus, Quantitative Research, Evaluation and Measurement, The Ohio State University.

Fang-Mei Law, associate professor, Psychology and Criminal Justice, Tiffin University.

achievements: “A recognition of the presence of errors in measurements, a conception of error as a random variable, and a conception of correlation and how to index it” (Traub, 1997, p. 8). In fact, CTT is a measurement theory about test scores that introduces three concepts—test score, true score, and error score (Hambleton & Jones, 1993). True score and error score are theoretical concepts and unobserved. The test score is the only score that can be observed. The relationship between these three scores is assumed as linear, i.e., test score is equal to true score plus error score. Alternatively, true score can be expressed as the expected scores in parallel tests.

CTT assumes that no correlations exist between true score and random error, neither between two random errors nor between true score and random error in different tests. An advantage of CTT is that they are based on relatively weak assumptions, i.e., they are easy to meet in real test data. However, CTT encounters a problem of interactive dependence between item and person factors. An examinee with a fixed ability level would be scored low on difficult tests and would be scored high on easy tests (Hambleton & Jones, 1993). Conversely, an item with fixed difficulty level would be regarded as difficult if most examinees fail on it and as easy if most examinees succeed on it. This limitation is because CTT cannot separate an ability parameter from the difficulty parameter.

Another source of dissatisfaction with CTT lies on the assumption of equal standard errors of measurement across all examinees. Nevertheless, since scores on any test are unequally precise measures for examinees of different ability, as Hambleton, Swaminathan, and Rogers (1991) indicated, the assumption of equal errors of measurement for all examinees is implausible.

Traditional item analyses focus on the analysis of item difficulty, item discrimination, and item distraction. In rating scores, since no answer is absolutely right or wrong and scores are based on a rater’s judgment, it is not appropriate to calculate item distraction. However, these item analysis approaches can be revised so as to calculate item difficulty and item discrimination in rating scored items. A high value of item difficulty indicates that the particular item tends to be rated by high scores, and vice versa. The high values of an item discrimination index, reporting the difference between the proportions of high and low scorers, are reputed to flag good items, and low values bad ones (Lopez & Stone, 1998).

Noll, Scannell, and Craig (1979) provided two indices for item difficulty (P) and item discrimination (D) in a rating-score situation. Both of them rely on the ratios of the scores in different groups and the maximal and minimal scores in an item. These two revised formulas are defined as follows:

$$P = \frac{S_H + S_L - (2N \times X_{MIN})}{2N(X_{MAX} - X_{MIN})} \quad (1)$$

and

$$D = \frac{S_H - S_L}{N(X_{MAX} - X_{MIN})} \quad (2)$$

where  $N$  represents of 25% total number persons,  $X_{MAX}$  and  $X_{MIN}$  are the highest and lowest scores in an item, respectively, and finally,  $S_H$  and  $S_L$  indicate the sum of scores in the high- and low-score groups, respectively.

On the other hand, the reliability of test scores on rating scales provided in CTT reflects the level of



internal consistency. Cronbach  $\alpha$  represents the general case of internal-consistency reliability. It is equal to the complement of the proportion of individual item variances to total score variance, and was adjusted by the number of items (Allen & Yen, 1979).

### **MFRM**

MFRM is an extension of the Rasch model. It is especially useful in the situations in which more than two facets interact to produce an observation (Linacre, 1994). As an extension of the Rasch model, MFRM shares the same assumptions with the Rasch family. First, the assumption of unidimensionality indicates that only one dimension of variable is measured in the process of assessment. Without holding this assumption well, as Linacre (1994) stated that many misfits between the data and model will occur if the assumption is rigidly applied. The second assumption is the local independence. It implies that, after taking judges' severity into account, no relationship exists between judges' ratings for different examinees on different items. These two assumptions are similar to those proposed by the general item response models. In addition, MFRM assumes that "judges are modeled to differ in severity or leniency... (and that) judges are modeled to exhibit some degree of stochastic behavior when awarding ratings" (pp. 6-8). The former statement indicates that severity is a parameter characterizing the judge, just as the ability characterizing an examinee or the difficulty characterizing an item. The latter statement illustrates that the estimation of the severity parameter could contain measurement errors, which could lead to misfits to the model.

Based on these assumptions, MFRM inherits two major features of Rasch model. First, the estimates of parameters are invariant across facets. In a three-facet Rasch model, for instance, the ability parameter for the examinee facet, the leniency/severity parameter for the judge facet, and the ease/difficulty parameter for the item facet are independent of each others. They keep their invariance property when they interact with other parameters. Second, these facet-free characteristics permit the facets to be linearly added. Thus, the facets can be expressed on a common scale and share the same property on the linear scale (Linacre, 1994).

MFRM not only provides an analysis of item difficulty, but also provides analyses of person ability and rater severity. The parameter of item difficulty is separated from that of examinee ability and from that of rater severity. Moreover, all of the measures provided in MFRM are based on new scale scores (logits), rather than on raw scores used in CTT.

Although the Rasch model further assumes that all items to have the same or approximately equal discriminations, Wright (1995) suggested that the infit *MnSq* (mean square statistics) can be regarded as an index providing information on item discrimination. The infit mean square statistic is an information-weighted Chi-square statistic divided by its degrees of freedom and is sensitive to unexpected inlying patterns among informative, on-target observations (Linacre & Wright, 1994). The expected value of the infit mean square is 1. Any value substantially less than 1 indicates that the observed item characteristic curve is flatter than the Rasch model and fails to differentiate different abilities levels of examinees. However, if the infit value is substantially larger than 1, it indicates an unusual discrimination and that must be investigated further (Wright & Stone, 1979).

On the other hand, for the MFRM and Rasch family, reliability is called separation reliability and is defined as the ratio of the squared separation to the sum of the squared separation and 1. Mathematically, the expression of separation reliability is equivalent to KR-20, or Cronbach Alpha (Linacre, 1999). The separation reliability shows how different the measures are. Notice that MFRM not only provides separation reliability for

the subjects, but also provides rater separation reliability and item separation reliability. The general form of reliability defined in the Rasch family is as  $REL = SEP^2 / (1 + SEP^2)$ , where SEP is the separation of parameter and is defined as the ratio of adjusted standard deviation to the root mean square standard error for the estimated parameter.

## Method

### Participants and Instrumentation

The data for this study were obtained from the scaled responses from the scoring of 124 competitive grant applications. There were 64 raters and each proposal was independently rated by a trio of raters using a 24-item scoring rubric. Raters were randomly assigned to each proposal and then rotated after each proposal rating so that the same three raters never rated an additional proposal together.

The raters were professionals in the content area of the proposals and were specifically recruited to participate in the scoring task. The raters were trained on proposal reading, the specifics of the RFP (request for proposal) and the scoring rubric prior to reading and scoring of the proposals. They were also pre-screened to avoid potential conflicts of interest in the proposals they were asked to score.

The 24-item scoring was created by referencing and indexing the major sections of the RFP, thus building in content validity. The items were scaled using a six-point continuum with a score of 1 representing “very weak”, “lowest rating” and/or “missing” and a score of 6 represented “exceptionally strong”, “exemplary”, or the “highest rating”. Each rater read and scored approximately 6 proposals. Thus, there were a total of 372 “reads” (124 times 3) and approximately 8,928 responses (372 times 24).

### Analysis Design

**Item difficulty and item discrimination.** In CTT, the minimum score in the data set is 1 and 6 for the maximum score across all items. The number of trials ( $N$ ) in this case can be regarded as the number of “reads” and, thus with a quarter selection, there were 93 high-score “reads” and 93 low-score “reads” (25%) chosen from the total “reads” (372). SPSS software was used to calculate the item difficulty index  $P$  and the item discrimination index  $D$ , which were provided by Noll et al. (1979).

In MFRM, based on the application, item and rater facets, a three-facet Rasch model were formulated in this study:

$$\log\left(\frac{P_{nijk}}{P_{nijk-1}}\right) = B_n - D_i - C_j - F_k \quad (3)$$

where  $P_{nijk}$  and  $P_{nijk-1}$  represents the probability of application  $n$  being awarded on item  $i$  by rater  $j$  a rating of  $k$  and  $k-1$ , respectively.  $B_n$  means the ability of the application  $n$ ,  $D_i$  means the difficulty of item  $i$ ,  $C_j$  means the severity of judge  $j$ , and  $F_k$  means the difficulty of the step up from category  $k-1$  to category  $k$ . Parameters of item difficulty and item discrimination will be estimated through the FACETS, a Rasch measurement computer program (Linacre, 1999), under scales of logit and  $MnSq$ .

**Reliability.** In this study, the coefficient of Cronbach  $\alpha$  was provided in CTT analysis. Three kinds of separation reliability (person, item, and rater) were provided in the analysis of MFRM.

CTT does not lend itself well to this situation... we usually have all raters scoring one common application or an estimate of the three raters for each application averaged across all trios of raters. This will have to be addressed.

## Results

### Descriptive Statistics

Descriptive statistics about item characteristics were displayed in Table 1. As can be seen, the means of rating scores range from 2.64 (AN17) to 4.75 (AN3), with AN20 showing the widest dispersion ( $SD = 1.49$ ). Most items tend to be slightly negatively skewed, except for AN16, 17 and 19, which implies that applications tend to receive relatively higher ratings from raters in these negatively-skewed items, especially for item AN10 ( $SK = -0.98$ ). Similarly, most items tend to be platykurtically distributed, but this is not apparent (the highest value of kurtosis is occurred in AN21,  $KT = -0.95$ ).

Table 1

*Summary of Statistics for Each Item ( $N = 124 \times 3 = 372$ )*

| Item # | M    | SD   | SK <sup>a</sup> | KT <sup>b</sup> | Item # | M    | SD   | SK <sup>a</sup> | KT <sup>b</sup> |
|--------|------|------|-----------------|-----------------|--------|------|------|-----------------|-----------------|
| AN1    | 4.15 | 1.22 | -0.34           | -0.53           | AN13   | 3.92 | 1.31 | -.47            | -0.36           |
| AN2    | 4.32 | 1.12 | -0.63           | 0.19            | AN14   | 4.32 | 1.16 | -.83            | 0.38            |
| AN3    | 4.75 | 1.01 | -0.70           | 0.39            | AN15   | 3.93 | 1.20 | -.33            | -0.31           |
| AN4    | 4.46 | 1.05 | -0.57           | 0.10            | AN16   | 2.99 | 1.30 | .14             | -0.72           |
| AN5    | 4.56 | 1.11 | -0.62           | -0.10           | AN17   | 2.64 | 1.27 | .44             | -0.49           |
| AN6    | 4.50 | 1.19 | -0.65           | -0.13           | AN18   | 3.37 | 1.39 | -.14            | -0.75           |
| AN7    | 4.39 | 1.07 | -0.68           | 0.16            | AN19   | 2.79 | 1.32 | .34             | -0.64           |
| AN8    | 4.50 | 1.29 | -0.90           | 0.29            | AN20   | 3.54 | 1.49 | -.18            | -0.94           |
| AN9    | 4.42 | 1.43 | -0.82           | -0.17           | AN21   | 3.37 | 1.47 | -.06            | -0.95           |
| AN10   | 4.64 | 1.22 | -0.98           | 0.57            | AN22   | 4.04 | 1.27 | -.55            | -0.33           |
| AN11   | 4.33 | 1.14 | -0.51           | -0.22           | AN23   | 4.08 | 1.29 | -.51            | -0.52           |
| AN12   | 3.70 | 1.32 | -0.22           | -0.73           | AN24   | 4.11 | 1.02 | -.69            | 0.25            |

Notes. <sup>a</sup> = skewness; <sup>b</sup> = kurtosis.

To grasp the whole information of the three parameters (ability, item ease/difficulty, and rater leniency/severity), a map of calibrations for all facets was shown in Figure 1. As can be seen, there showed a negatively skewed distribution for application ability, but a slightly negatively skewed distribution for rater leniency/severity, and a slightly positively skewed distribution for item ease/difficulty. In general, all three distributions approximate a normal distribution. Paralleling with the expected scores in scale 1 (abbreviated as S1), most applications tended to gain high scores (from 3 to 5) on these relatively easy items although more than half of raters were calibrated on the severe side of the distribution. Note that this slightly positive distribution for item difficulty in the logit scale revealed the same information and meaning as that of the slightly negative skewness in the scale of the CTT in Table 1. It is also interesting that the range of application ability dispersed so widely (from +1.4 to -1.7 logits) that the most and least able applications were out of the ranges of rater severity (from +0.9 to -1.2 logits) and item difficulty (from +1.1 to -0.7 logits). This means that except for a few extreme applications, items are suitable for most applications who encountered consistent raters in this study.

### Item Difficulty and Item Discrimination

The analyses of item difficulty are consistent across CTT and MFRM. The easiest item (AN3) identified by CTT with  $p = 0.74$  is analogously identified as the easiest one by MFRM with item difficulty equal to -0.73 logits. Similarly, the item of AN17 is identified as the hardest one among all items both by CTT ( $p = 0.33$ ) and by MFRM (item difficulty = 1.14 logits). Moreover, all items show consistent levels of difficulty analyzed by CTT and MFRM with a spearman rank correlation equal to 0.99 ( $p < 0.01$ ). This consistency can also be demonstrated by a significant correlation (Pearson product-moment correlation,  $r = -0.99$ ,  $p < 0.01$ ).

| Measr  | Application                                         | Rate                                    | Item    | S.1    |
|--------|-----------------------------------------------------|-----------------------------------------|---------|--------|
| + 2 +  |                                                     |                                         |         | +(6) + |
|        |                                                     |                                         |         |        |
|        |                                                     |                                         |         |        |
|        |                                                     |                                         |         |        |
|        |                                                     |                                         |         |        |
|        |                                                     |                                         |         |        |
|        |                                                     |                                         |         |        |
|        | 512                                                 |                                         |         |        |
|        | 405 409                                             |                                         |         | 5      |
|        | 477 478 516                                         |                                         |         |        |
|        | 454                                                 |                                         | 17      |        |
| + 1 +  | 408 412 413 418 476 490 497                         |                                         | + 19 +  | + +    |
|        | 411 420 431 435 442 458 510                         | 3032                                    | 16      |        |
|        | 410 425 451 466 482 489 494 502 515                 | 3061                                    |         |        |
|        | 422 461 462 469 480 481 496 498 499 501 507 517 524 |                                         |         | —      |
|        | 429 434 438 444 459 473 479 485                     | 3037 3047 3057                          |         |        |
|        | 426 430 449 464 467 504                             | 3011 3016 3020 3059                     | 18      |        |
|        | 401 406 414 421 432 437 447 450 453 484 492 509     | 3003 3008 3042                          | 21      |        |
|        | 445 457 472 483 511 518                             | 3007 3039 3051 3052 3060                | 12 20   | 4      |
|        | 428 486 493 508                                     | 3000 3015 3030 3031 3041 3044 3050 3056 |         |        |
|        | 404 443 452 463 468 470 500 506 520                 | 3013 3028 3034 3036 3038 3040 3043      | 13 15   |        |
| * 0 *  | 465                                                 | 3001 3035 3054 3055 3065                | * 22 *  | * *    |
|        | 419 427 441 455 471 474 488 514                     | 3006 3019 3025 3062                     | 23 24   | —      |
|        | 403 415 417 440 448 487 495 519                     | 3009 3014 3023 3058 3063 3066           | 1 11    |        |
|        | 407 416 436 513 522                                 | 3012 3021 3022 3024 3026 3045 3064      | 2 7 14  |        |
|        |                                                     | 3004 3010 3033                          | 4 5 6 9 |        |
|        | 433 460 491 503 505 521                             | 3027                                    | 8 10    | 3      |
|        | 423 424                                             | 3018 3029                               |         |        |
|        | 456 475                                             | 3005                                    | 3       |        |
|        | 446                                                 | 3049                                    |         |        |
|        | 402                                                 |                                         |         | —      |
| + -1 + |                                                     |                                         |         | + +    |
|        |                                                     | 3002                                    |         |        |
|        |                                                     | 3017                                    |         |        |
|        |                                                     |                                         |         | 2      |
|        |                                                     |                                         |         |        |
|        |                                                     |                                         |         |        |
|        | 439                                                 |                                         |         |        |
|        | 523                                                 |                                         |         |        |
|        |                                                     |                                         |         |        |
|        |                                                     |                                         |         |        |
| + -2 + |                                                     |                                         |         | +(1) + |
| Measr  | Application                                         | Rate                                    | Item    | S.1    |

Figure 1. Map of ability, severity, and difficulty parameters.

### Item Difficulty and Item Discrimination

The analyses of item difficulty are consistent across CTT and MFRM. The easiest item (AN3) identified by CTT with  $P = .74$  is analogously identified as the easiest one by MFRM with item difficulty equal to -0.73 logits. Similarly, the item of AN17 is identified as the hardest one among all items both by CTT ( $P = .33$ ) and by MFRM (item difficulty = 1.14 logits). Moreover, all items show consistent levels of difficulty analyzed by CTT and MFRM with a spearman rank correlation equal to .99 ( $p < .01$ ). This consistency can also be demonstrated by a significant correlation (Pearson product-moment correlation,  $r = -.99, p < .01$ ).

To more visualize this consistency, Figure 2 provided a scatter plot with a scale of  $p$  and logit provided by

CTT and MFRM, respectively. As can be seen, all items are almost in a straight line with opposite scale directions: the more the  $P$  value an item has, the less the logit value, and vice versa. This also indicated the consistency of item difficulty estimated by CTT and MFRM.

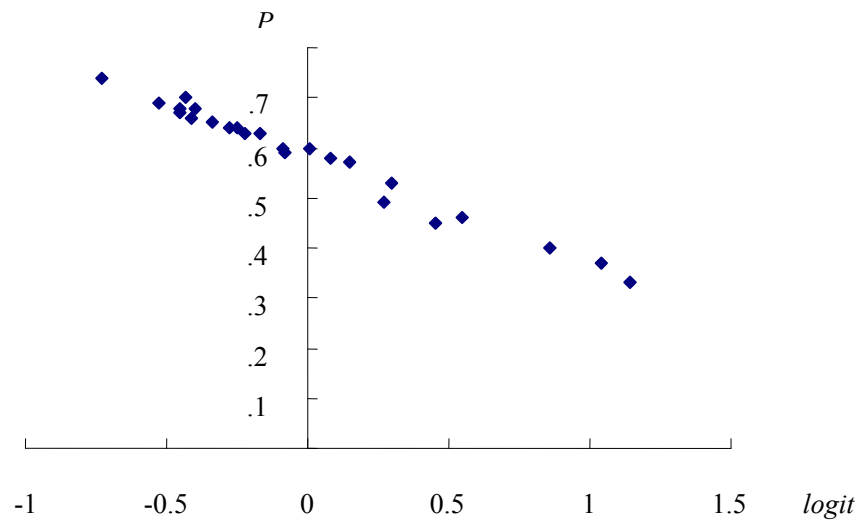


Figure 2. Scatter plot of scales for item difficulty from CTT( $P$ ) vs. MFRM ( $logit$ ).

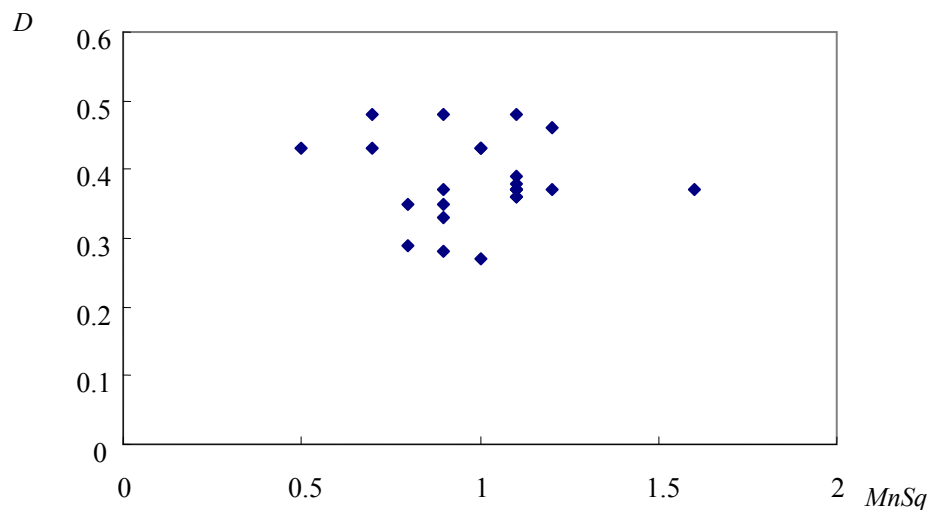


Figure 3. Scatter plot of scales for item discrimination from CTT ( $D$ ) vs. MFRM ( $MnSq$ ).

On the comparison of item discrimination, there were many inconsistencies between items in the two scales. Items with the poorest two discrimination indices in CTT estimation (AN3 and AN4 with  $D = .27$  and  $.28$ , respectively) were ranked as the 11<sup>th</sup> and 7<sup>th</sup> poorest discrimination items in the MFRM analysis. On the other hand, items with the highest discrimination indices in the CTT estimation (all AN15, AN18, and AN21 with  $D = .48$ ) were estimated as 0.7, 0.9, and 1.1  $MnSq$  but ranked divergently (see the 3<sup>rd</sup>, 10<sup>th</sup>, to 20<sup>th</sup> items). In addition, there was an extreme item (AN24) with the value of infit mean square ( $MnSq = 0.5$ ,

substantially less than 1), recognized as not as able as the other items to differentiate applications' abilities, but was identified as a highly discriminating item in the analysis of CTT ( $D = .43$ ). In contrast, an item identified as a fair discriminator (AN9) in the analysis of CTT ( $D = .37$ ) was labeled as a noisy discriminator with a high infit value ( $MnSq = 1.6$ ) by MFRM. A Pearson product-moment correlation ( $r = -.082, p = .08$ ) and a Spearman rank correlation ( $r_s = .17, p = .43$ ) demonstrated this inconsistency between the two discrimination estimations that showed a rough circle and a very asymmetric pattern in Figure 3.

### Reliability

Table 2 reveals the values of estimated reliability associated with the analyses of CTT and MFRM. As can be seen, MFRM provides the highest level of reliability overwhelming the other method with item separation reliability ( $REL. = .99$ ), application separation reliability ( $REL. = .96$ ), and rater separation reliability ( $REL. = .95$ ). The high reliability of the facet measures indicates that a strong difference of parameters exists among their corresponding facets. On the other hand, the Cronbach alpha coefficient provided by CTT is quite high ( $\alpha = .93$ ). This implies that individual items are highly consistent with the total score.

Table 2

*Comparisons of Reliability among CTT, G Theory, and MFRM*

| Analysis    | CTT                      | MFRM                                           |
|-------------|--------------------------|------------------------------------------------|
| Reliability | .93 (Cronbach $\alpha$ ) | .96 (Application)<br>.95 (Rater)<br>.99 (Item) |

### Discussion

Item difficulty indices estimated by CTT and by MFRM are highly consistent and correlated. This implies that both methods of estimating item difficulty index are equivalent. One of them can be used to interpret item difficulty for each item without missing much information. However, MFRM not only provides the estimate of item difficulty, it also provides the estimates of examinee ability and rater severity, which are separated from item difficulty. This consistent finding of difficulty estimates from CTT and MFRM is just as that Lord (1980) had mentioned. It is necessary to note that a two-parametric model used in Lord's book, but here is one parametric model.

In the comparison of item discrimination, many inconsistencies between CTT and MFRM may be due to two effects. First, CTT only considers the top quarter and the bottom quarter of samples. This implies that item discrimination in CTT is only appropriate for classifying the top quarter and the bottom quarter of examinees, but the item discrimination index cannot classify the middle part of examinees. However, MFRM analysis uses the entire data set to identify infit values. In this case, MFRM considers the middle part of the sample and provides corresponding infit indices. Second, CTT ignores the effect of measure error variations. However, MFRM considers the modeled variance in the estimation of infit statistics for each individual on each item. If the sum of individual variances is too large, the raw data set will depart from the ideal model for this item and, thus, may result in a low infit value. Conversely, if the sum of individual variances is too small, the raw data set will still depart from the Rasch model and might lead to a noisy infit value. Therefore, when we consider the total sample of examinees and individual modeled variance on each item, an item with a high discrimination index identified in the analysis of CTT might become more ambiguous in distinguishing examinees' abilities.

In the comparison of reliability, even though the mathematical formations of reliability introduced by the two methods are equivalent (the proportion of the variance of random error to the variance of total), their meanings are different. The Cronbach alpha coefficient emphasizes that the internal consistency between individual items and total score. A high coefficient value signifies means that a high level of consistency. High-total-score earners tend to earn high scores on individual items, and vice versa. However, it only provides the consistency information for items, with variability of item ease/difficulty and rater leniency/severity, neither for examinees nor for rater embedded in the error variance.

The high values of MFRM separation reliability shown in this study reveal two facts. First, the variance of random error is substantially smaller than the variance of applications, raters, and even items and, thus, most of the variety among applications, raters, or items is due to the main effects of their differences, rather than the effect of random error; Second, the high reliability of application measures indicates that the values of ability are strongly different across applications. Similarly, the high reliability of rater measures indicates that there is a strong distinction in rater leniency/severity among the raters, and the approximately perfect reliability of item measures indicates that there is a very apparent differentiation of item difficulty among these items. By not taking the rater leniency/severity into account in the analysis, some unadjusted application scores will be unjustly advantaged (lenient raters) or disadvantaged (severe raters).

To sum, we found similar estimates of item difficulty, reliability but different estimates of item discrimination by CTT and MFRM. MFRM provides more refined and defensible information. CTT has the variability associated with rater leniency/severity and variability of the applications embedded into the error term. That is, the separation of the estimates of parameters from MFRM seems to provide more diagnostic information for examinees, items, and even raters than the CTT theory does. In addition, it is more defensible than the CTT method because it takes the non-independence of the raters into consideration in the analysis, which cannot be easily handled by the CTT method. In fact, CTT only provides information for items. However, in the data set, some raters appear in application and not necessary to appear in other applications. Thus, it sounds a good suggestion that MFRM provides a better way to get a rating-base performance assessment than CTT does.

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# The Videinsight® Method: Application in Medical Orthopaedic Rehabilitation

Rebecca Luciana Russo  
Videinsight® Foundation, Turin, Italy

Stefano Zaffagnini  
University of Bologna, Bologna, Italy

Videinsight® means to have an insight by looking at a work of contemporary art. It indicates the aim and the psychological effect that are potentially provoked by the interaction with some selected contemporary works of art. The insight promoted by the work of art is the outcome of the activation of transference, of projections and reflections on the artistic product, of the unconscious elaboration that leads to the development of transformation. Videinsight® is a theoretical concept, a working method, a psychological process. It is based on the experience of exchange and integration between the contemporary artwork and the psychology of the people who relate to it. Some works of contemporary art provoke and stimulate the psyche and activate psychological mechanisms. They trigger an intellectual and emotional experience: They make us think and make us feel. Interacting with selected works of art means growing and activating the development of human potential. The Videinsight® method can be applied in prevention, diagnosis, psychological support, and psychotherapy for treatment of all psychological and psychosomatic diseases. It has been already applied in medical orthopaedic researches for rehabilitation and psychological support.

*Keywords:* Videinsight®, contemporary art, prevention, psychological support, psychological diagnosis, psychotherapy, rehabilitation, artworks, images, medical researches, well-being, Anterior Cruciate Ligament Reconstruction

## Introduction

From the moment they are born, children use their eyes to experience images, which are initially confused, but later they become clearer. Looking is the first way of discovering and learning about the world; constructing images is the simplest and most immediate way to represent reality within oneself. We think in images and translate the images into language. The mind is capable of producing mental images. We live in a world of images determined by the media. We are capable to produce mental images. The unconscious in the dream activity is expressed by images. We deal with the images continuously. The images are powerful: They can feel sensations and emotions in a privileged condition of spontaneous infantile regression. Some artworks, with their ambivalences, ambiguities, symbolism, and mysteries, perturb the unconscious, overcoming the barriers of defences and the resistances, break the rigid schemes, modify the distances, overturn the meanings, interrogate the multiplicity, and stimulate the emergence of new resources. They provoke perceptions, psychosomatic effects, emotions, affections, and feelings. They activate imaginations and fantasies, creativity

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Rebecca Luciana Russo, President of "Videinsight® Foundation", Director of "Videinsight® Center", psychologist, psychotherapist.

Stefano Zaffagnini, associate professor, School of Medicine, Istituto Ortopedico Rizzoli, University of Bologna.

through projections, and reflections. They promote knowledge: interpretations, processes, thoughts, reflections, learning, attitudinal orientations, and communications. They cause actions, decisions, socializations, and changes. They penetrate into the unconscious with greater strength and speed than words: driving and transmitting energy, revitalizing, affecting the personality in her operation and in her structure. They carry the identity to be no longer identical, placing her in suspension between many possibilities, pushing her towards the frontiers of creative change and towards new horizons of well-being. The images can touch deeply, and have a great impact on the personality because it can: (1) stimulate the cognitive reflection, the exchange, and the creativity; (2) develop fantasy, reflection, and psychosomatic dimension; (3) activate the communication, the action, and the decision; and (4) promote the attitudinal orientation and the socialization.

Videinsight® means the awareness activated by the artworks view. It is the result of transfer activation that means projection and reflection on the artist product and unconscious elaboration leading to the evolutionary transformation. To interact with an artwork means: to receive, to give, to transform, and to change. Some contemporary artworks are universal, transversal, immortal, eternal, always actual, and circular. They treat primary issues of the life that come back in every time and place. They are relational, since they can connect, create relationships, transform us as “Giani Bifronti”, and stimulate the view outside the external reality and inside ourselves (in interior world). They are symbolic and clue, since they can indicate and evoke something else. Contemporary artwork is potentiality. It conveys meanings, requests a sense attribution, and includes a message that must be kept, that is provocative, uncanny. It touches unconsciously and stimulates an experience simple, complex, total, dynamic, intellectual, aware, affectedness. Art is a mirror of unconscious himself. It is mysterious, does not close, solve, or explain. It urges questions, stimulates doubts, opens doors, breaks the habitude. Art can move the psychic process. It stimulates the creativity and reduces the resistances. Contemporary art can be diagnostic and therapeutic. Art can heal: It promotes the changes and solves the individual and relational psychological unease. Because it stimulates thoughts, memories, sensations, emotions, desires, fantasies, secrets, and narrations. It breaks the rigid scheme, puts in crisis the common thoughts, converts the meaning attributions, asks for multiple meanings; promotes the changes, stimulates the emergence of new resources, puts in suspension between many possibilities, puts away, lets travel, and opens new horizons. It pushes forward the frontier of unknown. It is anticipatory, prophetic. It reveals the future. It activates the “insight”: the interior vision, the awareness, the intuition, the illumination, and the problem solution with a sudden idea, immediate, that allows to visualize the problem in its globality, reaching in few instant, the searched solution. Art is a wonderful adventure. It is a mirror, that reflects, like a “Rorschach table”, the most intimate part of the observer (Schafer, 1954).

To talk about the artwork means to reveal ourselves. Some images of the contemporary art promote deep changes: They touch and move the most hidden, rigid, obscure parts of a personality. Art speaks about the basic and universal human needs. It is a real chance for everybody: an opportunity for development, progress, identification, and psychological emancipation. It stimulates an experience of freedom and intellectual lightness. It is emotional, affective, perceptual, and mnemonic. It obliges to think, to feel, to change. It transforms. It opens the doors of the future.

For this reason, as a consequence of the insight that stimulates in the viewers, some artworks can heal, help, promote well-being, support in each person the healthy part, and cure the weak, complicated, suffering part.

In 2011 Rebecca Luciana Russo introduced some selective contemporary artworks in the processes of psycho-diagnosis and psychotherapy, according to the Videinsight® concept and to the Videinsight® method

developed by her. She has tested these selected artworks for many years in the clinical setting with many patients, reaching very important and significant results. Videoinsight® means to have an “insight”: a simple and essential intuition, an illumination, a discovery, an awareness, a review deep and integrated, that involves mind and emotions at conscious and unconscious level. Videoinsight® can cause the evolution of personality, the solution of a psychological problem, the release from a stall and the promotion of the psycho-physic well-being (Russo, 2011).

The Videoinsight® method is applicable in favour of everybody because it proposes an experience instinctive, natural and simple, that is independent of age, gender, socio-cultural membership, religious beliefs, and linguistic competence. The Videoinsight® method integrates culture and health in an innovative, holistic, and interdisciplinary way. It has been proven effective by the medical science, with the utmost rigor of objectivity, according to the current international standards. It is a scientific method, realistic, and applicable in practice. It is focused on the person and it represents a privileged way for the cultural welfare, as it is an approach to the social and individual health and wellness, that relates the quality of the psychological experience with the system of care and prevention. It improves the people's lives, increases the social welfare, reduces the time and the costs of the cares, fights the chronicities, prolongs the existential expectations, and reduces the stress: Accordingly, it can bring benefits and savings under the economic and social profile as well (Russo, 2012).

The artworks are selected with competence, responsibility and professional ethics by the psychotherapist, on the basis of the psychological needs of the viewers. Sometimes they contain sounds, but never words, immediately engage the mind and the heart, break the defences of the intellectual judgment and bias, stimulate the narrative interpretation, and activate the insights by pressing on the personalities potentials. The ability to select the appropriate artworks is the result of a multi annual experimentation carried out on a significant sample, on the basis of a specific and integrated skill, in the psycho-therapeutic and artistic fields (Russo, 2013).

The Videoinsight® method has been tested in the psychological and medical clinical settings: (1) for the diagnosis of the personality structure and functionality; (2) for the analysis of the request of psychological support, and for the discovery of the capacities of reliance, collaboration, motivation within the relations with the others; (3) for the prevention of the psychological distress related to the evolutionary crisis (in the adolescence, in the disengaging in adult age, in the post-traumatic stress, in the psychosomatic problems and in the physical and senile illness); (4) for the orientation and the qualification of attitudes and talents, functional for the support of the personality's healthy resources; (5) for the rehabilitation of the psychological resources as a result of impairment due to a physical illness, a trauma, a stress that transforms the vulnerability into a crisis or into an evolution stall; and (6) for the psychological support of personalities in crisis and for the psychotherapy dedicated to the solution of the problems, of the complexes, of the evolutionary difficulties, of the constraints, of the psychological and psychosomatic symptoms.

Significant results were obtained in cases of neuroses: generalized anxiety disorder, separation anxiety, obsessing, compulsion, panic attacks, anxiety, hysteria, phobia, agoraphobia, social phobia; post-traumatic stress disorder; sado-masochistic disorders; character disorders, narcissistic disorders of the personality, disorders with paranoid traits, border-line disorders; avoidance disorders, passive aggressive disorders of the personality; disorders from dependences (from substance use: food, alcohol, tobacco, opiates, cannabis, sedatives, hypnotics, barbiturates; from the game, from internet, from the couple, of symbiotic type, from the failure of leaving the

family); psychosomatic disorders, somatoforms, from conversion, psychogenic; hypochondria: psychosexual disorders, adaptation disorder, affective disorder, depressions.

### **Description**

In January 2012, Dr. Rebecca Luciana Russo introduced the Videoinight® method in an experimental annual medical research, regularly approved by the Institutional Ethical Committee. This first Research has been performed with the most rigorous methods of international research protocol and has been conducted at Rizzoli Orthopaedic Institute in Bologna, Italy. The title of the study was: “Video-Acl Research: The application of the Videoinight® Method to improve the functional recovery after anterior cruciate ligament reconstruction”. The experimental protocol has been conducted in collaboration with Prof. Maurilio Marcacci and Prof. Stefano Zaffagnini’s equipe. Specifically, Rebecca Russo has shown to 100 adult patients, during the rehabilitation program, 16 artistic videos selected and evaluated according to their high or low Videoinight® impact. The objective of the study has been to evaluate the efficacy of Videoinight® method in improving and speed up the functional recovery of patients during the rehabilitation phase after anterior cruciate ligament reconstruction surgery of the knee. For the first time, the contemporary art is used according to this innovative approach in medicine, as a rehabilitation support. The results of this research have been significant and have been published in International Scientific Journal in January 2013 (Zaffagnini, Russo, Marcheggiani Muccioli, & Marcacci, 2013).

In June 2013, a second experiment for the application of the Videoinight® method in medicine has started at Rizzoli Orthopaedic Institute in Bologna. The name of this new research is “Video-TKA (Total Knee Arthroplasty)”. It is an annual experimental research protocol regularly approved by the Ethical Committee and will follow the most rigorous scientific methods of international research protocol. The title is “The use of the Videoinight® method to improve the physical recovery after cemented total knee prosthetic implant”. The study is performed in collaboration with the Physical Therapy and Rehabilitation Department of Rizzoli Orthopaedic Institute directed by Prof. Maria Grazia Benedetti and with the Second Orthopaedic Department of Bologna University.

In this study, 100 elderly patients that underwent total knee prosthesis will perform the rehabilitation program with the support of the Videoinight® method. Specifically, it shows 4 artistic videos selected for their high Videoinight® impact to 100 old patients that perform rehabilitation protocol after TKA surgery. The objective of the study is that “The use of Videoinight® method positively influences the pain level and the functional post-operative recovery of patients operated of total knee prosthesis at 3 months follow-up”.

At international level the application of the Videoinight® method is performed in a pilot multicentric study to treat the anterior knee pain in young patients with patello-femoral problems not suitable for surgical treatment. This study is executed simultaneously: at University of Minnesota in Minneapolis Orthopaedic Surgery Centre directed by Prof. Elisabeth Arendt, M.D., in France at the Lyon Orthoclinic Chirurgie du Sport et de l’Arthrose directed by Prof. David Dejour and in Japan at the Kobe University in cooperation with Prof. Ryosuke Kuroda. The title is “The application of the Videoinight® method for the treatment of anterior knee pain patients”. The Research is in cooperation with Prof. Stefano Zaffagnini at the Rizzoli Orthopaedic Institute in Bologna. It is the third experimental application of the Videoinight® method in medicine. Moreover is the first international multicentre experimental application of Videoinight® method in medicine. For the first time the Videoinight® method is utilized as a therapy and not only as a support to a post surgical Rehabilitation protocol.

## Materials and Methods

To describe more in details the study performed after ACL reconstruction (Zaffagnini et al., 2013), we built a single blinded parallel arm randomized controlled trial between February 2012 and October 2012. All patients more than 16 years-old undergoing the first- time ACL arthroscopic reconstruction on the injured knee and that gave written consent to undergo study procedure were enrolled. Patients with combined lesions or disorders were excluded.

Approval was obtained from the IRB (Internal Review Board) of Istituto Ortopedico Rizzoli, Bologna, Italy, according to the official guidelines of the Declaration of Helsinki. All subjects were informed about the study procedure.

Computerized randomization generated two groups: Group A and Group B.

The standard surgical procedure was performed in all ACL reconstructions. In particular, over-the-top single bundle with the additional extra-articular tenodesis on the lateral compartment, was performed in all patients using autologous semitendinosus and gracilis tendons (Marcacci, Zaffagnini, Giordano, Iacono, & Presti, 2009; Marcacci, Zaffagnini, Iacono, Neri, Loreti, & Petitto, 1998).

All patients underwent the same standardized post-operative rehabilitation protocol, with no brace. Quadriceps exercises started on the first post-operative day. Patients were allowed to partial weight bearing during the first two weeks. Full weight bearing was allowed from the third week. Running was recommended after two months, and cutting and lateral sports were allowed four months after surgery (Cupal & Brewer, 2001; Decarlo, Shelbourne, McCarroll, & Rettig, 1992; Zaffagnini, Bruni, Marcheggiani Muccioli, Bonanzinga, Lopomo, Bignozzi, & Marcacci, 2011).

According to the Videoinight® method, Group A (study group) received one art video that was established to produce positive and therapeutic “insight”, while Group B (control group) received one art video with an “insight” unfavourable to the psychological recovery.

The art videos for Group A were selected according to the following 10 principles of the Videoinight® method:

- (1) The video shows powerful images, with or without sounds, that quickly and deeply penetrate the unconscious of the patient;
- (2) It expresses universal messages related to the primary needs of life;
- (3) It stimulates the mind at a conscious level (intellectual comprehension) and the affectivity at an unconscious level (emotive resonance);
- (4) It contains metaphors with therapeutic potential;
- (5) It stimulates narrative processes: story telling, interpretation and trauma elaboration;
- (6) It promotes identification, reflection, projection and transfer process;
- (7) It activates insight that means interior intuition, consciousness raising, psychological transformation;
- (8) It reduces the resistance;
- (9) It increases creativity;
- (10) It catalyzes the change;

The art videos for (control) Group B were selected in contrast to the same principles.

All the patients had to watch the video 2 times a week, during the first 3 months.

The lists of art videos used for Group A and for Group B are reported in Table 1.

Examples of the two different types of videos are given in Figures 1 and 2.

The Videoinight® method requires a selection of contemporary art videos based on the diagnosis of the specific psychological needs of the patient. In this case, considering the necessity to rehabilitate the motor function of the strolling, the following needs of the operated patients were diagnosed a priori: the confidence, the patience, the motivation, the resistance, the collaboration, the commitment, the perseverance.

The videos used in the research were selected by the trained psychotherapist among those previously experienced for 10 years in the clinical setting with different types of patients (anxious, depressed, obsessive, psychosomatics, and dependent). The method is the result of a trial of hundreds videos in hundreds clinical cases. In this long history of application of the Videoinight® method in clinical cases, several videos were effective in helping people with different symptoms. The videos used contain messages that stimulate the insight, are easy to interpret, activate the storytelling, show performances made by the artists themselves or by third parties.

Table 1

*List of the Selected Art Works for the Treatment and Control Groups*

| Treatment group                                            |  |                                   |      |
|------------------------------------------------------------|--|-----------------------------------|------|
| Title                                                      |  | Author                            | Year |
| <i>Dying Swans</i>                                         |  | Elena Kovylna                     | 2007 |
| <i>Forever Overhead</i>                                    |  | Marzia Migliora                   | 2010 |
| <i>Over the Sea</i>                                        |  | Sophie Whettnall                  | 2007 |
| <i>Piel</i>                                                |  | Regina Iosè Galindo               | 2001 |
| <i>Daniela Ha Perso il Treno</i>                           |  | Sissi                             | 2003 |
| <i>Dance Company</i>                                       |  | Ali Kazma                         | 2009 |
| <i>My Love Is an Anchor</i>                                |  | Kate Gilmore                      | 2007 |
| <i>Someone Say the Moon Is Easy to Touch</i>               |  | Driant Zeleny                     | 2010 |
| Control group                                              |  |                                   |      |
| Title                                                      |  | Author                            | Year |
| <i>1969</i>                                                |  | Goldie Chiari                     | 2010 |
| <i>To Ann Marie</i>                                        |  | Lindholm Petra                    | 2010 |
| <i>Made in Box</i>                                         |  | Mari Sue                          | 2008 |
| <i>It, Heat, It</i>                                        |  | Provoust Laure                    | 2010 |
| <i>The Artist</i>                                          |  | Provoust Laure                    | 2010 |
| <i>Singspiel</i>                                           |  | Von Brandenburg U.                | 2009 |
| <i>The Descend of Man and Selection in Relation to Sex</i> |  | Mona Chisa Anneta & Tkaoova Lucia | 2010 |

In the Research VideoACL, the video was shown to the hospitalized patient in bed, for the first time through a PC in the hospital, the day after the operation. Subsequently, the patient has seen the video at home in autonomy, through a demo video, with a frequency of three times a week for three months. A skilled operator was present during the first application only, then the patient has watched the video alone. The operator has given to him a technical schedule on which he should write all the feelings, thoughts, stories stimulated by the vision of the video. This schedule has been used by the patient for the entire duration of his treatment.

The patient was motivated to look at the video from the psychotherapist in charge of the research and from the Doctor that performed the surgery, with the same issue: “Do you want to watch a video of contemporary art that contains therapeutic incentives during your convalescence? We do recommend it”. The patient received the

indication to watch the video in silence, several times, being alone, to take note and to review the spontaneous insights on the schedule. This document has been subsequently consigned to the Doctors Team at the end of the treatment and has been always checked during the clinical visits. The “insight schedule” becomes a sort of personal psychotherapeutic diary for each patient.



*Figure 1.* Example of an art video used for the Treatment Group: Migliora M. Forever overhead, video still (2010). Courtesy of Videoinsight® Center, Turin, Italy.



*Figure 2.* Example of an art video used for the Control Group: Mona Chisa A, Tkacova L. The descend of man and selection in relation to sex, video still (2010). Courtesy of Videoinsight® Center, Turin, Italy.



It was decided to show videos to the control group as well, because the objective of the research was not to demonstrate the effectiveness of watching a video, but the effectiveness of watching certain types of selected videos, containing specific therapeutic messages. The control group components have watched videos without a therapeutic content, in other words placebo videos.

The application of the method did not present particular difficulties. The method is applicable in other areas of clinical research. Any future research will require a different selection of videos, according to the objectives of the psychological support that will be pursued.

## Results

One-hundred and one patients were evaluated at mean  $3.0 \pm 0.2$  months follow-up (see Table 2).

Table 2

### *Demographic, Surgical, and Follow-Up Details of the Patients Involved in the Study*

|                                              | Treatment group   |            |           | Control group     |            |           | <i>p</i> -value |
|----------------------------------------------|-------------------|------------|-----------|-------------------|------------|-----------|-----------------|
|                                              | Mean              | St. Dev.   | Range     | Mean              | St. Dev.   | Range     |                 |
| Age at surgery (years)                       | 33.8              | $\pm 11.1$ | (18-41)   | 32.9              | $\pm 12.5$ | (18-40)   | $p = 0.5371$    |
| Final follow-up (month)                      | 3.0               | $\pm 0.2$  | (2.8-3.1) | 3.0               | $\pm 0.2$  | (2.8-3.2) | $p = 0.4325$    |
| BMI at surgery (kg/cm <sup>2</sup> )         | 24.1              | $\pm 2.2$  | (22-29)   | 23.8              | $\pm 2.2$  | (22- 29)  | $p = 0.8972$    |
| BMI at final follow-up (kg/cm <sup>2</sup> ) | 24.0              | $\pm 2.7$  | (23-29)   | 23.7              | $\pm 2.7$  | (23-29)   | $p = 0.4517$    |
| From injury to surgery (months)              | 5.8               | $\pm 2.1$  | (1-9)     | 6.1               | $\pm 2.9$  | (1-8)     | $p = 0.7435$    |
| Sex (Male/Female)                            | 40 (78%)/11 (22%) |            |           | 40 (80%)/10 (20%) |            |           | $p = 0.5643$    |
| Knee involved (Right/Left)                   | 24 (47%)/25 (53%) |            |           | 21 (42%)/29 (58%) |            |           | $p = 0.4987$    |

The two groups were homogeneous regarding pre-operative age, gender, weight and height, interval from injury to surgical treatment, subjective IKDC (International Knee Documentation Committee), Tegner, SF-36 and TSK (Tampa Scale of Kinesiophobia) scores (Apolone & Mosconi, 1998; Monticone, Giorgi, Baiardi, Barbieri, Rocca, & Bonezzi, 2010; Padua, Bondi, Ceccarelli, Bondi, Romanini, Zanolli, & Campi, 2004; Tegner & Lysholm, 1985).

All scores significantly improved ( $p < 0.05$ ) from pre-operative status to final follow-up in both groups.

Significant improvements were observed in Group A compared to Group B at final follow-up for subjective IKDC ( $p = 0.047$ ), TKS ( $p = 0.0141$ ) and time to crutches discharge ( $p = 0.0012$ ) (see Table 3). No significant difference between Group A and Group B for tegner score, SF-36 physical status, although a positive trend for Group A was detected (see Table 3).

Table 3

### *Clinical Outcome Scores at Three Months Follow Up*

| Score                 | Evaluation      |        |                  |        | <i>p</i> -values   |
|-----------------------|-----------------|--------|------------------|--------|--------------------|
|                       | Treatment group |        | Control group    |        |                    |
| Subjective IKDC       | 82.0            | ± 13.8 | 71.0             | ± 19.7 | <i>p</i> = 0.0470* |
| SF-36 Mental          | 50.9            | ± 8.7  | 50.9             | ± 7.3  | <i>p</i> = n.s.    |
| SF-36 Physical        | 55.6            | ± 8.2  | 52.6             | ± 8.4  | <i>p</i> = n.s.    |
| Tegner Activity Level | 5               | 4-6    | 4                | 3-6    | <i>p</i> = n.s.    |
| TSK                   | 28.1            | ± 6.0  | 32.0             | ± 5.8  | <i>p</i> = 0.0141* |
| Crutches (Days)       | 20.9            | ± 5.0  | 26.5             | ± 8.2  | <i>p</i> = 0.0012* |
| Objective IKDC        | 33A, 18, 0C, 0D |        | 33A, 17B, 0C, 0D |        | <i>p</i> = n.s.    |



## Discussion

The most important finding of this prospective randomized study was that the use of the Videoinight® method during the early rehabilitation phase after an ACL reconstruction permits to increase the subjective outcomes at three months.

This is the first study where the Videoinight® method has been applied in Orthopaedics to improve the global functional and psychosomatic results after surgery, while it has already been applied with highly satisfactory results in psycho-diagnosis and psychotherapy (Marcacci et al., 2009; Marcacci et al., 1998). This method is unique because it does not utilize simple image or modelling video but it combines the power of images itself with the emotional one given by the artistic world.

Various psychological interventions have been proposed or utilized in the injury recovery setting. These include imagery (Ievleva & Orlick, 1991; Sordoni, Hall, & Forwell, 2000; 2002), goal setting (Theodorakis, Beneca, Malliou, & Goudas, 1997), electromyographic biofeedback (Levitt, Deisinger, Remondet, Ford, & Cassisi, 1995) and stress inoculating training (Ross & Berger, 1996).

Motor imagery is a technique that is overlapping with physical execution, since it activates the same brain regions used during motor performance. For the equivalence between imagery and action, motor imagery has been a used strategy to improve motor performance in rehabilitation and variety of sport (Sordoni, Hall, & Forwell, 2000; 2002).

Another technique that has received limited attentions during rehabilitation is the observational learning or modelling (Apolone & Mosconi, 1998). Only two studies have analysed the efficacy of such strategy during ACL rehabilitation.

Flint (1991) examined the role of coping models compared to no models on psychological factors and functional outcome following a rehabilitation programme for ACL reconstruction among 10 basketball players. The study showed increased self-efficacy at three weeks after surgery in patients watching a modelling videotape.

Maddison, Prapavessis, and Clatworthy (2006) evaluated the efficacy of modelling video to reduce pre-operative perception of anxiety and pain as well as post-operative self-efficacy and functional outcome after anterior cruciate ligament reconstruction. They reported significantly lower perceptions of expected pain pre-operatively and significantly greater self-efficacy at pre-discharge to perform rehabilitation tasks, confirming that watching a modelling videotape is effective in increasing rehabilitation self-efficacy and early function. Although effective in reducing pain and increasing self-efficacy, Maddison et al. (2006) reported that the self-efficacy was more related to the enactive master experience gained during exercise. Moreover, the analysis failed to show that modelling interventions could enhance psychological factors capable to enhance functional variables.

In the present study, on the contrary, it was demonstrated that the use of the Videoinight® method in the early rehabilitation phase after ACL reconstruction through a psychological insight can promote a subjective and mental improvement. The Videoinight® method originality is to combine the effect already observed by using images, with the emotional one achieved by using contemporary artworks. These specific images permit higher self-consideration, increasing the intrinsic motivation to work and problem solving. Moreover, improve autoplasmic adaptation to reality, the stress reaction flexibility to adverse event and increase the resistance capacity to exercise and fatigue. Images with high psycho-diagnostic and psychotherapeutic potential can treat

the symptoms of psychological and psychosomatic discomfort that accompany the disease and can enhance the cognitive, emotional and behavioural resources needed to tackle the path of evolution, care and rehabilitation. It is not a coincidence that the Rorschach Test, the world-class excellence tool adapted for the diagnosis of profile and personality functioning, consists of the administration, qualitative and quantitative analysis, and interpretation of projective answers provided by candidates in response to ten ink-stain images.

Art is symbolic. It is the archetypal possibility to have primordial images which echo the voices of all of humanity; it contains subconscious and innate ideas, which are repeated throughout history, whenever the creative imagination of the individual is practiced freely (Russo, 2011; 2012; 2013).

The Videoinight® method is original and different compared to the modelling techniques (Flint, 1991; Maddison, Prapavessis, & Clatworthy, 2006), because it relies on the capacity of the art video images to promote an intrinsic elaboration at the psychological level. It was capable not only to speed up the rehabilitation period (as described by Maddison et al. (2006) and Flint (1991)), but also to enhance patient's motivation and self-esteem as shown by the low mean TSK reported for Group A. TSK and the time while the patients need to walk with crutches are directly correlated, demonstrating not only a psychological, but also a somatic effect of the method.

Unfortunately, the IRB refused to apply to each patient a psychological profile according to Rorschach tables (Schafer, 1954). In this way, we could have also analysed the different efficacy of the Videoinight® method according to the psychological patients profile and probably could have been capable to detect which patients could have had better benefit from the view of artwork, and secondly we could have been more selective in which type of artwork showing to the patients according to his psychological profile.

This approach, with its intrinsic capacity to promote the change could have other interesting applications in the treatment of other orthopaedic pathologies where the psychological support and the psychological patient profile are important. This methodology could become a universal method to support the patients not from the somatic only, but also from the psychological point of view, considering the patient as a global unit that includes body and mind.

## Conclusions

This is the first time that not only video technology, but also the power of art are used in conjunction to enhance the recovery after surgery in order to treat the patients as a global unit including all aspects: anatomical, functional, and psychological.

The Videoinight® method combined to adequate rehabilitation could be an effective tool in the day-by-day clinical practice in order to improve short-term functional outcomes in patients who underwent ACL reconstruction.

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